

AGRICULTURAL CHEMICALS

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Agricultural Plants
Is Emphasized

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Research in the
Atomic Age

Efficiency in
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Essential to Greater
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in 20th Annual Meeting

Sulfur Shortage
Laid to Excessive
Exports

Am. Plant Food Council
Holds Convention

Positive Outlook
for 1952





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Every production batch of POWCO BRAND material is chemically tested in our modern expanded laboratories.

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AGRICULTURAL CHEMICALS



A Monthly Magazine
For the Trade

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THIS MONTH'S COVER

Production of fruit in adequate quantities is impossible without use of insecticidal sprays. Alternative to spraying is having a wormy crop, unacceptable for human consumption. Annual expenditure for agricultural insecticides is around \$60 million, but losses to uncontrolled insects are many times that figure. Photo shows heavy spray applied in orchard. (Photo by F. E. Myers & Bros. Co.)

VOL. VI

No. 7

JULY

1951

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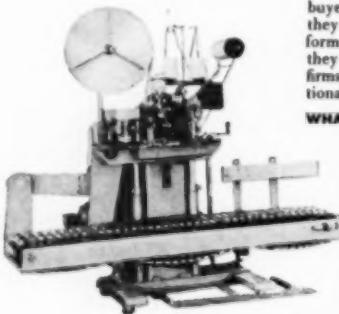
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JULY, 1951

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GRANT BUILDING

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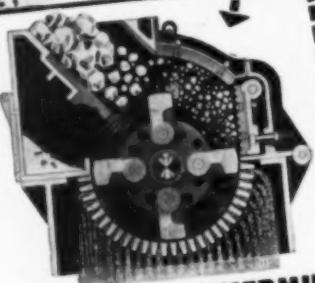
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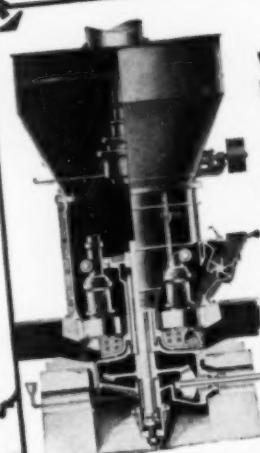


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Also for disintegrating ammonium sulphate lumps and fertilizer mixes that "set-up" in storage.

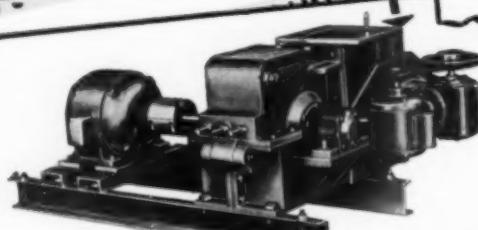
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ROCK PHOSPHATE... LIMESTONE
BHC... PYRETHRUM... SABADILLA
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For pulverizing rock phosphate, gypsum, limestone, sulphur dusting, etc. Used for blending and pulverizing insecticide mixes such as BHC, DDT, and toxaphene but in higher concentrations than Hammermills will handle.

WCB-1



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3 CONTROLLED MANUFACTURE
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BOOKLET



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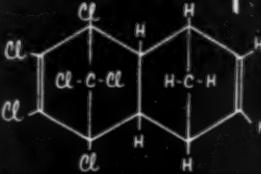
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aldrin

is

hexachlorohexahydro-
dimethanonaphthalene



But to the

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it's Murder!



Your formulations require less chemical content when you use aldrin . . . a decided economy. And your customers are *demanding* aldrin's amazing control . . . a demand that indicates prompt action to supply it.

aldrin 

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STOP

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FOR FERTILIZER MANUFACTURERS

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Southern
States"



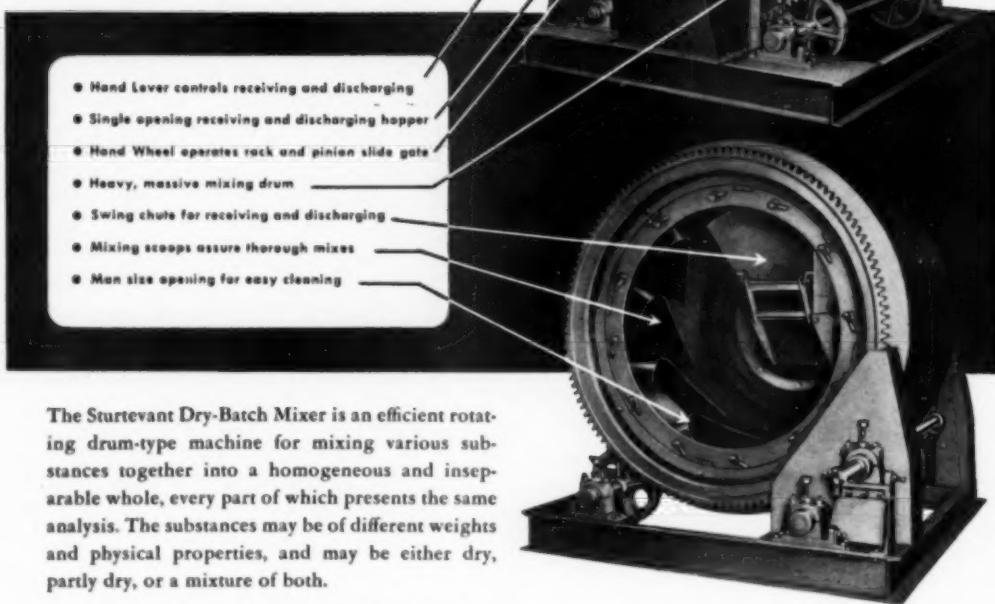
Technical advice and assistance to fertilizer manufacturers in solving their manufacturing problems is available for the asking.

LION OIL COMPANY **CHEMICAL DIVISION**
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Economical Mixing



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- 5 models...a size for every mixing job...smallest size mixes up to $7\frac{1}{2}$ tons per hour...largest size up to 75 tons per hour.

Reputation...

**built on
40 years
of service
to agriculture**



Many of our present customers were among our first ones over forty years ago, and they often remark that one thing about us has never changed: the Ashcraft-Wilkinson reputation for reliable service.

Users and manufacturers of agricultural insecticides everywhere know that Ashcraft-Wilkinson stands squarely behind every product sold. Our own laboratory, located near the source of raw materials, enables us to analyze and certify chemicals as to formula and

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Today, with agriculture again assuming so vital a role in the national effort, Ashcraft-Wilkinson stands ready to provide—as always—the most complete, dependable service on the finest quality chemicals for agricultural insecticides:

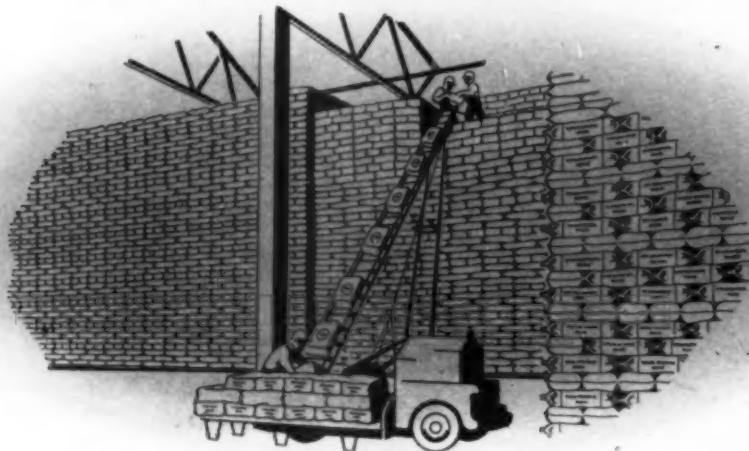
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A Complete Line of Diluents: Talc, Pyrophyllite, Clay, Fuller's Earth

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Much more goes into **HAMMOND** Multi-Wall **BAGS**
than the products they dependably carry



Yes, a great deal more goes into Hammond Multi-Wall Bags than the hundreds of products that are now safely and dependably shipped in them. Here are a few reasons for Hammond's steady growth and for the steadily increasing demand for these Better Bags:

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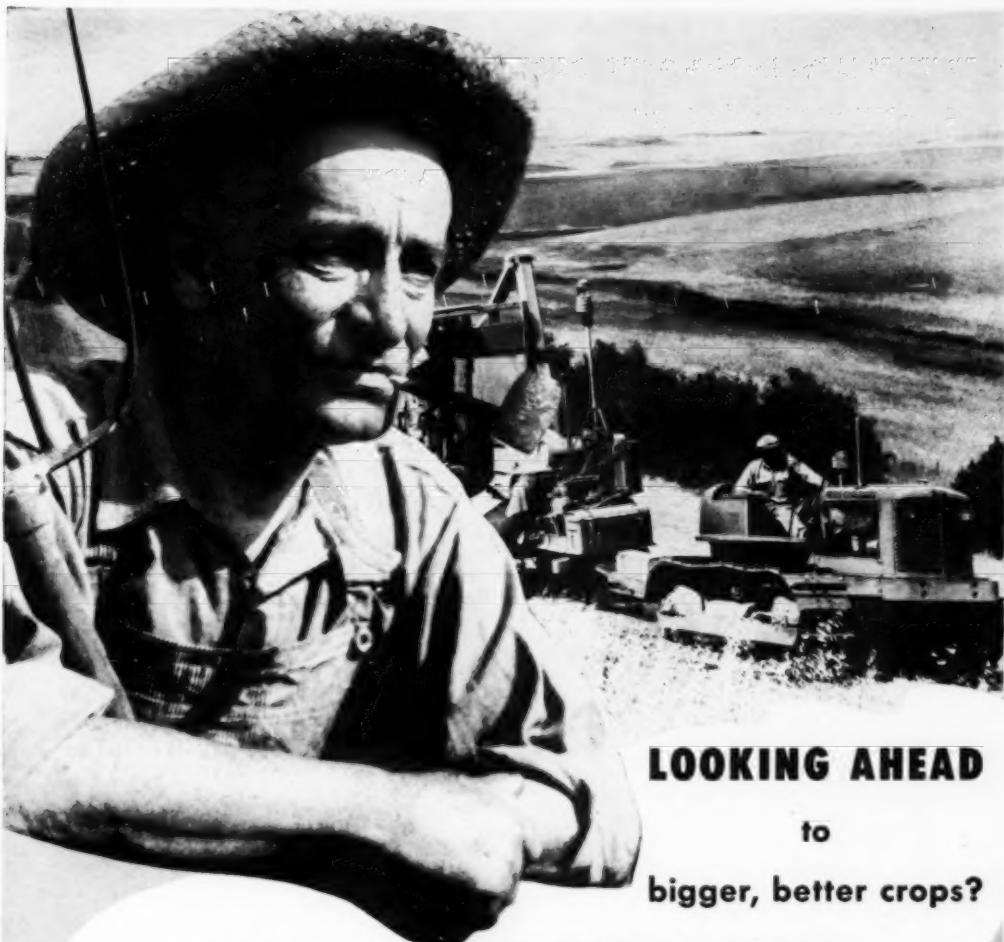
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THE EDITOR COMMENTS

WITH the Delaney Committee having recessed for the time being, one is inclined to look back over the long parade of witnesses and pick from the many thousands of words of testimony, some of the more significant utterances. The testimony of well-qualified entomologists and toxicologists has more than withstood the abuse of the few who tried their best to make insecticides, fungicides and fertilizers responsible for a good share of the ills that beset humankind.

We don't see how the committeemen can avoid being impressed with the tremendous volume of scientific data available to squelch the notion that the world would be better off by forgetting agricultural sprays and dusts. No doubt the Congressmen who sat day after day hearing witnesses testify, have long since realized that the United States cannot feed its increasing population and act as breadbasket for most of the rest of the world, if it allows agricultural pests to devour a large percent of its crops.

The viewpoint of the public, however, is somewhat jaded by newspaper stories which magnify the fears expressed by some witnesses that the country is being poisoned by use of these pesticides and that cancer, TB, polio and heart disease are all products of these agricultural chemicals. Almost completely silent are the newspapers, however, when sound (but unsensational) testimony is presented by witnesses of the calibre of Dr. Charles E. Palm, Dr. F. C. Bishopp, Dr. Frank Princi and Dr. George C. Decker, to name but a few of the many able and reliable scientists who have appeared.

It has been noticed by observers that the committee members themselves are becoming better acquainted with the subject, and are asking intelligent questions on their own accord rather than leaving all of the questioning to the counsel.

Unofficial talk around Washington says that the Committee may hold its next hearings on the West Coast. A visit to that area where agricultural chemicals play such a major part in citrus production should add its own testimony

to the growing conviction that agricultural pesticides are really here to stay!

RECENT action on the part of U.S.D.A. in meeting the sulfur shortage appears to be based on a wise premise; namely, that educating the users of fertilizers and insecticides on the conservation of sulfur is more effective than issuing restrictive regulations. A committee of scientists representing different sections of the U. S. is studying ways and means of reducing the amount of phosphate in fertilizer mixtures, hoping eventually to arrive at a 1-1-1 ratio which would not only conserve sulfur but at the same time would increase crop yields. Through cooperation with state agencies and industry groups holding regional meetings, the information about sulfur conservation will filter down to the farmer level.

W. R. Allstetter, Director of the Office of Materials, Supplies and Facilities of Production and Marketing Administration, U.S.D.A., says that we are far from being over the hump in the sulfur supply situation; that conditions will be worse before getting better. He points out the increasing demand for fertilizers and other agricultural chemicals requiring quantities of sulfur as evidence that every effort will have to be made toward greater conservation on the farm.

By increasing the nitrogen content of fertilizer mixtures, it is hoped that more efficient use of phosphate may be found. Production of both nitrogen and potash is expected to be increased, so there should be but little difficulty in stepping up the content of this part of the fertilizer mixture to the 1-1-1 ratio or a 2-1-1 ratio being investigated by members of the committee.

Much has been said and done about the shortage of sulfur, and many suggestions for solving the problem have come in from all over the country. But this move on the part of the Department of Agriculture strikes us as a most realistic approach to the base of the problem . . . that it is possible to use the material more wisely on the farm without sacrificing crop yields.

Safety Theme is Emphasized

by
Paul T. Truitt

President, American Plant Food Council
Washington, D. C.



THE matter of safety, always a subject of great importance, comes into particularly sharp focus at the present time when America is called upon to produce goods at peak efficiency. The fertilizer industry is taking definite steps toward promoting safety measures in plants across the nation in order to serve the agricultural public better. By doing so, we can advance the welfare of persons engaged in the industry, strengthen the private enterprise system and promote the public interest.

There are compelling reasons why the fertilizer industry must serve the public better; and that means at peak efficiency. Since only 16% of our population is engaged in agricultural pursuits, the total burden of the nation's supply of food and fibre rests upon this comparatively small group. When compared with conditions revealed in the census of 1790 at which time 90% of the population was working to produce agricultural crops, it is clearly seen that the U.S. depends more and more upon a group constantly decreasing in size. Yet we have succeeded in raising the American

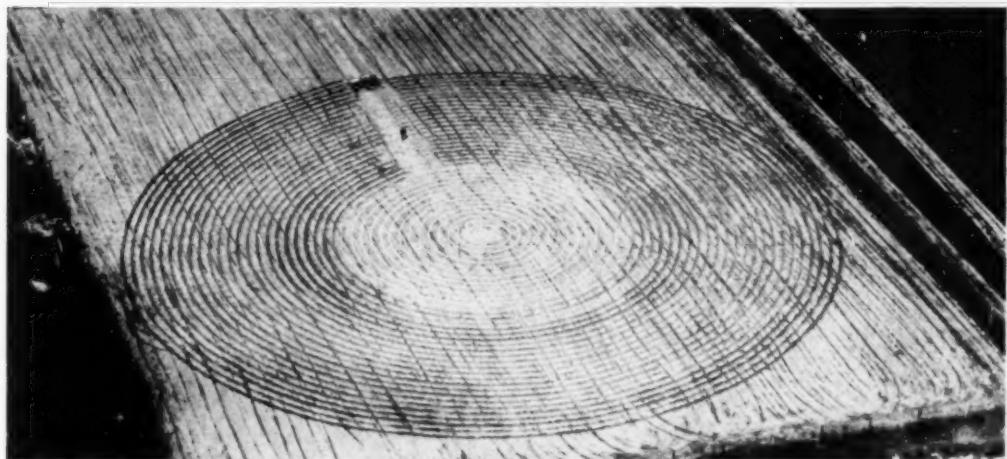
standard of living to the highest level in the entire world.

Better techniques and scientific "know-how" on the farm, constantly improved machinery, a rapid growth in power supplied by gasoline and electricity, and of course, the application of commercial fertilizers to increase the productivity of the soil have combined to bring about the high level of American production.

As more and greater yields are demanded from each acre, the fertilizer industry will be called upon to bear an increasing share of the responsibility in meeting such demands. And this is the point at which safety enters in to increase the industry's output, make more goods available, reduce costs and eliminate so far as possible, the loss of man hours because of injury.

An all-out safety program must begin with top management. This is a cardinal principle. In many instances, supervisory personnel at lower levels are inclined to look upon safety as a bother and an inconvenience, even a nuisance. If such personnel has any idea that top management is not keenly inter-

(Turn to page 113)



Agricultural Research in the Atomic Age

RADIOISOTOPES are relatively new, having been first produced artificially by the Curies in 1932. Since then they have become an essential tool of the research worker. Through their use it is possible to do many difficult tasks rapidly and a number of otherwise impossible ones with precision. Useful in tracing what happens in a biochemical reaction, they are equally valuable in tracing the flight of mosquitoes and other insects. This article discusses how they are used in the modern, scientific agricultural laboratory and particularly how they are used in problems dealing with agricultural chemicals.

Before the war, experiments with radioisotopes were limited because they could be produced only in cyclotrons and other particle accelerators. With the development of the nuclear reactor or atomic pile it has become possible to produce radioisotopes in quantity, and the Atomic Energy Commission has set up an Isotope Distribution Program which makes them available to any

by
Dr. A. E. Dimond
Connecticut Agricultural Exper. Station
New Haven, Conn.

qualified research worker. At first, their use was limited almost entirely to studies in biochemistry, but they are now so readily available and the techniques for handling them have been so improved that agricultural research workers are using them also.

An isotope is a species of chemical element. For example, phosphorus, as it occurs naturally, has an atomic weight of about 31. When phosphorus is placed in an atomic pile, the nuclei of phosphorus atoms are bombarded with neutrons and some of them are changed to another isotope of phosphorus, having an atomic weight of 32.

Radiation field, at center of which is quantity of cobalt-60 to provide reasonably intense source of gamma radiation. Plants are grown at varying distances from this source and for varying times to determine the relations of dosage and dosage-rate (intensity) to radiation damage in plant cells. (Photo: Brookhaven National Laboratory).

P^{32} does not occur naturally, yet its chemical reactions are identical with those of P^{31} . This fact makes it useful as a tracer in chemical or biological processes. P^{32} , moreover, is radioactive and gives off beta particles (electrons) energetically as its nucleus becomes stable again. Its radioactivity makes possible the detection and estimation of quantities of P^{32} by electronic means which are undetectable by chemical methods.

The unnatural occurrence and radioactivity of unstable isotopes are the properties which make them so useful in research. Because they can be detected in almost unbelievably small traces, the scientist can use them to follow reactions which he could never follow with ordinary chemical methods. A dramatic example of how sensitive are the methods by which elements can be identified and traced is the experience of the Eastman Kodak Company, shortly after the first atomic bomb explosion in New Mexico.

Any film manufacturer must have high control of quality over



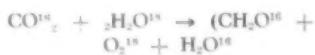
Above: Abnormal reduction division in pollen cells of *Trillium erectum* when they are exposed to ionizing radiation. Note that the process is not regular and

that bits of chromosomes have broken off and have failed to migrate to the poles of the cell. (Photo: Brookhaven National Laboratory)

his product. A fresh batch of double-coated X ray film, which had been packed only three weeks was found to be spotted when it was developed. Eventually the investigator assigned to the problem, Dr. J. H. Webb, found that the strawboard in which the film was packed was radioactive. This paper had been made in a plant in Vincennes, Indiana, and other lots of paper made in this plant had not been troublesome in this way. The paper was made only 20 days after the explosion of the atomic bomb in New Mexico, in a plant 1000 miles away from the site of the explosion. Dr. Webb analyzed the very slight traces of radioactivity and identified the element which was radioactive! This element, cesium-141, does not occur naturally but is one of the most abundant products of an atomic bomb. Quite obviously the element was carried eastward and fell with rain upon fields where plants were growing. These absorbed the radioisotopes, and contained it when made into strawboard. However slight the amounts were, they were sufficient to darken the photographic film and to permit the identification of the element involved.

Because a radioisotope does not occur naturally, the scientist can

distinguish what has been added of an element from what is already present in a system. This makes possible the investigation of many problems which could never be tackled by other means. In point of fact it is the unnatural occurrence which makes certain isotopes useful in tracer work, and not their radioactivity. Certain stable isotopes of oxygen, nitrogen and carbon are used as tracers even though they are not radioactive and detected in the mass spectograph. One piece of research now of several years standing, made use of O^{18} , a stable isotope of rare occurrence naturally, by combining it to form water. Plants were supplied with the compound in photosynthesis and the reaction was traced as follows:



This study enabled investigators to say with assurance for the first time that the oxygen, a product of photosynthesis, arises entirely from water molecules which enter into the reaction. As a result, our views on the nature of the photosynthesis reaction have been profoundly changed.

Sources of Radiation

Q UITE apart from being used as tracers, radioisotopes may be used as sources of radiation. Thus cobalt-60 emits only gamma radiation, an electromagnetic radiation which is more penetrating than X rays are, whereas phosphorus-32 emits only beta particles. Radio-cobalt needles are now used in cancer treatment by locating them at the point to be irradiated, whereas bakelite plaques impregnated with radio-phosphate may be employed in experiments which deal with the effect of beta radiation on organisms.

Experiments involving radioisotopes may be one of two types: those in which something is irradiated, using the isotope as a source of radiation, and those in which the isotope is used to tag a molecule so that it may be traced. Since radiation of the sort emitted by radioisotopes may have profound effects upon living cells, the investigator who employs them in tracer reactions in biological systems must always be careful not to use more of the tracer than the minimum necessary to follow the reaction in which he is interested. In general, this amount of radiation has no perceptible effect upon cells, whereas if he uses a considerable excess of isotope to make counting spectacular, he may alter the behavior of cells as a result of their exposure to ionizing radiation.

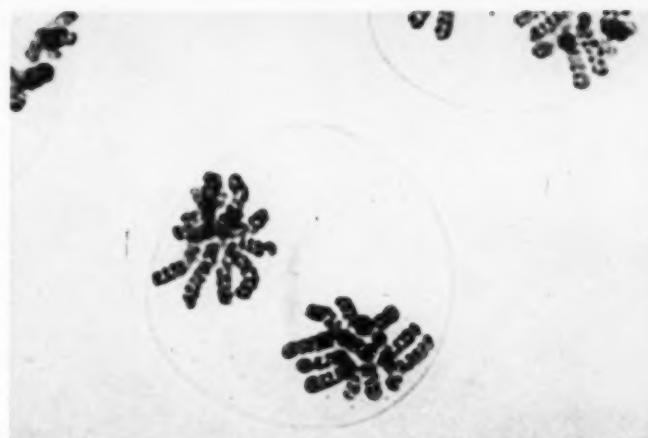
Radiation in Agriculture

I ONIZING radiation may have a number of effects upon living cells. Two of the effects are well known: (a) vegetatively dividing cells cease division or slow down temporarily depending upon dosage when subjected to ionizing radiation, and (b) cells in reproduction division may divide abnormally and give rise to mutant offspring. Mutants can also be produced without abnormal cell division. Biologists are studying how these effects come about and also what steps may be taken to make cells more resistant to ionizing radiations. Each of the effects of ionizing radiation on living cells has in-

terest for the agricultural research worker.

The first of these effects, namely the effect upon vegetatively dividing cells, is under study at The Connecticut Agricultural Experiment Station. Workers there, under contract with the Atomic Energy Commission, are exploring the possibility of curing plants infected with fungi by exposing them to ionizing radiation. In this sort of study the fungus must be more susceptible to radiation than the host is. Plants are exposed to gamma radiation in a radiation field (Page 35) at the Brookhaven National Laboratory at the center of which is a considerable quantity of cobalt-60, a source of gamma radiation. Plants may be exposed to varying intensities of radiation by placing them at different distances from the source and to varying dosages by leaving them in the field for a suitable time. In general it appears that the fungi which cause plant diseases are more resistant to such radiation than are the host plants, so that there is little chance that diseases can be cured in this fashion. However, fungi accumulate sulfur and phosphorus more than the host cells do, and it is possible that by feeding plants with the appropriate radioisotope, the radioactivity will accumulate at the site of infection, and damage the fungus more than the host. This possibility remains to be studied.

Experiments of similar nature have been carried out on the crown gall disease of tomato. This disease is caused by a bacterium which secretes a substance with remarkable properties. After host cells have been in contact with this compound for a period of a few hours, they break into unlimited and uncontrolled growth and galls develop wherever this happens. Ionizing radiation in such a case, should retard the development of galls by suppressing the vegetative division of host cells. When tomato plants which have been inoculated with crown gall bacteria are subjected to gamma radiation under suitable conditions, they do not form galls, even though



Above: Normal reduction division in pollen cells of *Trillium erectum*. Note the regular pairing of chromosomes in

this division as it occurs in the absence of radiation damage. (Photo: Brookhaven National Laboratory.)

bacteria still capable of causing galls in unirradiated plants are present.

How ionizing radiation may be of interest in control of plant diseases experimentally is illustrated by the work of Miller and Wolken. Working with two species of fungi which cause stem end rot of oranges, they grew these fungi on culture media which contained radio-phosphorus. The radioactive isotope was supplied at levels which would ordinarily be regarded as tracing levels, i.e., the radio-activity was very low. Yet when fungi grown on such media were inoculated into oranges (even though the inoculum showed no detectable radioactivity) they produced stem end rot much more slowly than inoculum from unexposed cultures did. Evidently the ionizing radiation had affected the fungi so as to reduce their disease-producing ability.

The second effect of radiation on cells, the effect on cells undergoing reproduction divisions, is also of interest. If abnormal daughter cells arise from irradiating the dividing cell, these daughter cells are mutants. It is said that the mutants which are produced in this fashion are not especially different from the mutants obtained in any other way;

treatment merely makes mutation a more likely event. If this be true, treatment of cells by ionizing radiation is a means of producing mutants in an accelerated fashion, and this method may be used by geneticists and plant breeders in producing new strains of plants of interest to agriculture.

There is an outstanding example of how such work serves mankind. When penicillin was first being developed commercially, the strains of *Penicillium notatum*, the mold which makes this antibiotic, were not very efficient in their yields. Two research workers at the University of Wisconsin, Backus and Stauffer, exposed spores of this mold to ultraviolet light and obtained a mutant which gave greatly increased yields of penicillin. This strain of mold was quickly adopted for the industrial fermentation (which is a kind of mold farming) to produce improved yields of penicillin. Later Demerec used X rays to produce other mutants with still higher yields of penicillin.

Geneticists now can locate the points on a chromosome which are responsible for many of the characteristics which give to an inbred line its unique identity. They can say

with considerable assurance that the mechanism which governs whether or not a corn is susceptible to the fungus *Helminthosporium carbonum* is located at a particular point on a certain chromosome. The more detailed such chromosome "maps" are, the more precision is brought to genetics fundamentally, and the more guided becomes the search of the plant breeder for a variety of plants having defined characteristics.

Dr. W. R. Singleton of the Brookhaven National Laboratory is using ionizing radiation as a means of accelerating mutations which would occur normally to determine the site or locus of a gene which governs a given characteristic, and he is also studying the frequency with which a particular mutation occurs. Some mutations seem more likely to occur than others. Through such fundamental studies the improvement of corn and other crops can be placed on a secure basis.

One effect of ionizing radiation upon plants which is not yet fully understood, but which is of interest to agriculture has been described by Dr. Arnold Sparrow of the Brookhaven National Laboratory. He has grown *Tradescantia paludosa*, a plant related to the blue-flowered wild plant familiar as a spring flower, in a field where it was constantly exposed to gamma radiation. When it received radiation of moderately low intensity for a three to four month period, the growth habit of the plant was changed markedly. Instead of one growing point, these plants developed a number of buds, some with flowers and some vegetative, all of which developed slowly. What causes such abnormal development will be under study and may provide a clue to what it is that causes witches brooms in diseased plants when they are infected by certain virus diseases and by certain fungi.

Other Effects on Plants

Some effects on plants, reported as benefits of exposure to radioactivity, have been explored and proven not to be true. Thus, after

the atomic bomb blasts in Japan, reports came to the U. S. of greatly increased growth of plants and improved crop yields in the areas where bombs had been dropped. These effects were claimed to be caused by exposure of the plants to radioactivity. The levels of radioactivity were known to be low, and, although scientists discounted such rumors, experiments were undertaken to determine whether "fertilizers" which were radioactive did have such an effect upon plants. The United States Department of Agriculture, in cooperation with several of the Agricultural Experiment Stations, prepared a number of radioactive samples to be distributed on soil and a number of crops were grown on soil so treated. No effects, one way or the other, were noted upon growth or yields of crops. The improved growth of crops in Japan was probably the result of bringing into cultivation new land which had previously been the sites of buildings, and of the fertilizing effect of wood ashes upon the soil.

Tracer Reactions

JUST as radiation experiments are of value in increasing our knowledge of genetics, so tracer experiments are of equal value in aiding the research worker in biochemistry, physiology and certain aspects of biophysics. Tracers are almost uniquely suited to studies involving steps in processes.

By far the greatest amount of work relating to agriculture has been done on the subject of the behavior of fertilizers in soils and plants. One of the problems which has long perplexed soils specialists is how fertilizer elements get into the plant from the soil. Years ago it was believed that fertilizer elements exist in solution in water and that the plant simply absorbs what is already in solution. As research on soils became more exact this view was modified because many elements were found to be tightly bound by adsorption on the ultimate soil particle. The question then arose: how does a particle bound on soil become available for plant growth again?

Gradually the idea of ion exchange became established, according to which some elements adsorbed on a soil particle may be exchanged for others in the soil solution. By such exchange the soil solution could still enter the plant. Even this idea had to be modified since plants could apparently obtain more of an element from the soil than was available in the soil solution. Jenny and Overstreet then suggested that the roots of plants themselves may enter into exchange of ions with soil particles on contact. Tracer reactions have been helpful in describing what goes on when a plant absorbs ions from the soil.

Vlamis and Pearson recently used radioactive zirconium and niobium, two elements of little nutrient value for the plant but which are very tightly held by adsorption to the soil particle. Neither sulfuric nor hydrochloric acid will elute them, nor would acetic acid, the extractant commonly used in soil analyses. These workers, by making counts of radioactivity, showed that carbonic acid similarly would not remove them, but that solutions of a number of the organic acids found in plants would. They showed, further, that plants growing in a soil containing these radioelements tightly bound could obtain them from the soil and become radioactive. That carbonic acid would not make these elements come off soil particles is important because it has been claimed that the carbon dioxide released from roots in the respiratory process dissolves in the soil solution, and the carbonic acid solution rather than water is the solvent by which plants extract bound elements from the soil. Research showed that ion exchange resins in contact with clay which had adsorbed these elements could remove them. Research with tracers has thus shown that either roots absorb elements tightly bound by the soil through contact exchange or else they secrete organic acids which elute them from clay. To what extent such compounds as citric acid

(Turn to Page 111)

The story of the methoxy analog of DDT . . . a thorough study of the material through the eyes of a scientist.

METHOXYCHLOR

If it were possible to produce an insecticide providing quick kill of any and all insect pests and at the same time being harmless or even beneficial to the health of warm-blooded animals, people in general and agriculture in particular, would regard it as a real achievement. This ideal insecticide would have a residual span much greater than that of any material now known, and in addition would be fool-proof so far as application is concerned. And of course, such a product would be priced economically.

The agricultural chemical industry cannot offer such a fabulous material today nor in the foreseeable future; it can only aim in that direction in the development of new insecticides. This paper describes methoxychlor, a relatively new material which has found a number of uses within the past three years.

Biologists of the Du Pont pest control laboratory first evaluated methoxychlor early in 1942, when it was submitted by E. W. Bousquet ¹. It showed promising biological properties, low toxicity to warm-blooded animals, and safety to sensitive plants. These advantages led to full scale study of its properties, and its eventual appearance on the market.

Information included in this discussion does not come solely from Du Pont investigations by any means. It reflects extensive testing and analyses of methoxychlor by many state and federal experimental stations.

Methoxychlor is the approved ² common name for 2, 2 - bis(*p* - methoxyphenyl) - 1, 1, 1-trichloroethane, earlier called methoxy DDT,

DDMT, methoxy analog of DDT, and dianisyl trichloroethane.

The preparation and properties of methoxychlor are summarized in Table I. Technical grade methoxychlor contains about 88% of the *p,p'*-isomer and 12% of closely related compounds. Highly purified methoxychlor has a melting point of 89°C. (uncorr.) and its specific gravity is 1.41 at 25°C.

It can be formulated as dilute dusts, wettable powders, liquid oil concentrates, oil emulsifiable concentrates and aerosols. It is slightly soluble in hydroxylic organic solvents, more soluble in paraffinic solvents and vegetable oils, and very soluble in aromatic, chlorinated and ketonic materials. It is insoluble in water, acids and alkalies.

Stable Toward Alkaline Matter

WHILE methoxychlor can be dehydrochlorinated under alkaline conditions to form the unsaturated ethylene derivative, which is an insecticidally inert molecule, Cris-tol³ found it the most stable of eight DDT-type compounds. As pointed out by Prill et al. ¹⁰, greater stability toward alkaline matter is a desirable property for many insecticidal uses.

Solid methoxychlor is relatively stable to strong irradiation

with ultra-violet light. Field results indicate that methoxychlor has a residual effectiveness from two-thirds to as long as that of DDT, depending on the insect to be controlled and other conditions. Methoxychlor is slightly less soluble than DDT.

Low Toxicity Among Organics

ACCORDING to Lehman¹⁴, — toxicological problems associated with their (insecticides) use must be considered from several aspects. These may be listed as studies of the acute and chronic effects, dermal toxicity, the biochemical aspects related to absorption, distribution, and excretion, and pathological studies. When the insecticidal materials are compared in these respects, the present status of the sequence from the most to the least hazardous is seen in table I, next page."

Lehman ¹² has compiled toxicity data which indicate that methoxychlor is less than 1/24 as toxic as DDT from the acute oral standpoint, based on feeding tests with white rats.

In further discussions, Lehman ¹³ said, "Symptoms from a single acute dose of methoxychlor may not appear, since it is rather doubtful whether an individual would swallow enough to cause poisoning.—The fatal dose for man is estimated to be in the neighborhood of 450 grams (1 lb.) if ingested at one time."

Chronic Toxicity

THE Haskell Laboratory of Industrial Toxicology of the Du Pont Company studied comparative toxicity of DDT and methoxychlor in 1944 and 1946 ²¹. Upon feeding minimal doses to dogs over a ten-

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week period, it was observed that DDT caused physiological disturbances, whereas methoxychlor did not. It was further observed that animals fed DDT (dogs and rats) or inundated with DDT (rabbits) showed a considerable amount of DDT storage in body fat, whereas animals treated similarly with methoxychlor showed minimal or no storage. In general, tests to date have demonstrated that methoxychlor has little or no tendency to be stored in the body fat of animals to which it is fed or applied.

Welch²⁰ conducted tests on sheep. Capsules containing 4-1/2 grams of methoxychlor or DDT were administered every morning. The dosage represents the amount of insecticide on one day's feed of forage yielding one ton per acre, sprayed at a rate of five lbs. per acre. Treatment for 60 days with methoxychlor produced no change in weight or appearance. Severe symptoms of poisoning occurred when DDT was fed.

Lehman²¹ has also reported that multiple applications of 600 milligrams per kilogram of methoxychlor in solution is hazardous to the skin of rabbits, but with DDT, only 150 milligrams per kilogram is hazardous. Experiments at Haskell likewise indicate a lower systemic toxicity for methoxychlor than DDT.

Methoxychlor in Animals

SMITH¹¹, Zapp²² and others have shown that severe tremors, nerve injury and neurological disturbances produced by DDT do not occur when animals are exposed to either large or small quantities of methoxychlor.

Woodward et al.²³ and Von Oettingen et al.²⁴ agree that the fate of methoxychlor and also the rate of its detoxification are not well understood. Woodward, reporting that unchanged methoxychlor and the correspondingly substituted acetic acid were not found in the urine, stated that "apparently the metabolism of this compound involves more profound changes in the molecule than occur with DDT".

TABLE I
RANKING OF ORGANIC INSECTICIDES,
FROM MOST TOXIC TO LEAST TOXIC

1. Tetraethyl pyrophosphate
2. Parathion
3. Compound 497
4. Nicotine
5. Compound 118
6. Chlordane
7. Toxaphene
8. DDT
9. Rotenone
10. Beta isomer BHC
11. Gamma isomer BHC
12. "Lethane" 384
13. "Lethane" 384 Special
14. Technical BHC
15. Alpha isomer BHC
16. "Lethane" 60
17. "Thanite"
18. Delta isomer BHC
19. DDD (TDE)
20. "Octacide" 264
12. Methoxychlor
22. Pyrethrum
23. N-propyl isome
24. Piperonyl butoxide

Biological Aspects

LABORATORY tests show methoxychlor to be the outstanding candidate in the series of alkyl ethers of the parent compound 2,2-bis (p-hydroxyphenyl)-1,1,1-trichloroethane, and closely related compounds.

Methoxychlor approaches pyrethrum in its rapid paralytic effect against houseflies, and gives faster knockdown than DDT, although it is not quite as lethal as DDT at low dosages.

Standard Peet-Grady fly tests at Du Pont's Pest Control Laboratory have shown that a 2g per 100 cc deodorized kerosene solution of DDT is required for 98% knockdown of flies in about seven minutes, while a 0.25g per 100 cc methoxychlor solution achieves the same effect.

The paralytic activity of methoxychlor and pyrethrins has also been compared. A check of methoxychlor solution versus pyrethrins showed 100% knockdown with 3% methoxychlor in 4.5 minutes, as compared with 99% knockdown in 2 minutes for 0.1 gram pyrethrins per 100 cc.

Aerosols

TESTING of methoxychlor in aerosols has shown that the rapid paralytic action noted in Peet-Grady tests is also carried over to aerosols. It is indicated that the py-

rethrin or pyrethrin-synergist content of the aerosols can be reduced significantly with no loss of knockdown and kill, and with a resulting saving in formulating costs.

Using the recommended dosage of approximately 4 grams per 1,000 cubic feet in a Peet-Grady chamber, an aerosol formula containing 2% methoxychlor, 1% DDT and 2% pyrethrins showed greater knockdown in the first five minutes, but the same actual percentage of flies down in 15 minutes as another formula without DDT. Both these formulas accounted for a 99% knockdown in 15 minutes, as contrasted with 93% down in the same time from an aerosol solution containing 2% DDT and 0.4% pyrethrins, with no methoxychlor.

Methoxychlor has also been tested against various household insects and those attacking humans (1, 2, 6, 11, 15). Effective in a manner comparable to DDT are 5% dusts of methoxychlor for such pests as bedbugs, both German and American roaches and silverfish. It is also effective against insects which attack stored grain and seed, such as caddelies, grain borers, flour and grain beetles, mealworms, and moths, when applied to surfaces at a 2.5% residual spray. The low toxicity makes this residual insecticide especially helpful around dairy barns, granaries, food processing plants and in the home.

Use on Livestock

THOUSANDS of animals have been sprayed with or dipped in methoxychlor, and no injury to any animals has been reported. The USDA³ reports that young calves are not harmed by a single application of as high as 8% methoxychlor.

Although several insecticides are known to penetrate the skin and to appear in the milk of animals, methoxychlor presents no such hazard to consumers of milk products.

The appearance of insecticides in milk was described by Carter⁴. In tests on herds of dairy cattle sprayed four times during the summer, weekly milk samples from each herd were analyzed. In over 90% of the samples tested, no methoxychlor was found in the milk. In samples that did show methoxychlor, the investigators doubted the insecticide had been absorbed through the skin of the animal. By comparison, DDT appeared in every sample, and at a level (0.6 p.p.m.) six times that of methoxychlor.

Interest in methoxychlor insecticide reached a new high in the spring of 1949, winning approval by the U. S. Department of Agriculture¹ as safe to use on dairy cows and slaughter animals. Since use of DDT and many other chlorinated hydrocarbons was cited as possibly dangerous, the whole problem of use of residual insecticides became much debated by the public as well as by scientists and users of these materials. This concern has emphasized even more the interest in methoxychlor as a relatively safe and effective product for control of insects on livestock, on crops, in households and industrial plants.

The material is effective in controlling many insects affecting livestock. Its residual action is equal to that of most insecticides suggested for use on animals.

Methoxychlor is not effective against hog mange (sarcoptic) or ticks. It will not control deer or horse flies (tabanids), although it appears to repel these insects for several days.

Some of the more important

tests on livestock are described below:

Hornflies. The U. S. Department of Agriculture has reported⁵, "Methoxychlor gave good control of hornflies on cattle. A 0.5% wettable-powder spray (2 qts. per mature animal) applied to dairy cattle in Texas and to beef cattle in Kansas provided 20 to 24 days protection, as compared with 28 to 30 days for DDT. In Missouri both materials protected animals for about 6 to 7 weeks."

Fourteen official cooperative tests⁶ on hornfly control were run during the summer of 1948 in Kansas and Missouri at a concentration of 0.5% methoxychlor prepared from 50% wettable powder. The shortest period of protection was 42 days and the longest was 85 days.

Cattle Lice. Complete kill of short-nosed ox louse was obtained on a herd of 72 steers with 0.4% methoxychlor applied by high pressure sprayer. The hair was found to be insecticidal to lice at the end of 20 days, which is longer than the known incubation period for eggs of this louse. Other experiments showed that biting ox lice can be completely controlled in one treatment of 0.25% methoxychlor, and long-nosed ox lice with one application of 0.5% methoxychlor.

Cuff⁷ has confirmed these results by showing that complete louse control on cattle was obtained by the application of 0.5% methoxychlor.

The work of the USDA⁸ has been summarized as follows: "Sprays containing 0.5% methoxychlor gave good control of short and long-nosed cattle lice. It also showed promise comparable with that of DDT for controlling the tail louse."

Stable Flies and Houseflies. In summary of numerous du Pont tests in barns on stable flies: "Methoxychlor is very good as a residual spray for stable flies on surfaces on which flies remain for a long time. Methoxychlor will do as much to control stable flies as any other residual insecticide currently known."

Cuff⁹ reports that 1% con-

centration of methoxychlor, when properly applied to dairy cattle, helps reduce the number of stable flies for about one week.

The USDA¹⁰ reports, "Methoxychlor has shown considerable promise for the control of the stable fly. In cage tests, a wettable powder spray containing 0.5% methoxychlor applied to cattle prevented feeding of stable flies for several days and killed most of the flies that took blood during the first week after treatment. DDT did not prevent flies from feeding, but killed flies that took blood."

Eddy and McGregor¹¹ state that methoxychlor is superior for stable fly control in knockdown and duration of effectiveness. Cages treated with methoxychlor and stored outdoors for 50 days gave 100% knockdown in 14 minutes; DDT and several other insecticides were ineffective.

For houseflies, the USDA¹² reports that under laboratory conditions methoxychlor is almost as long-lasting as DDT.

Sheep Keds and Sheep Scab Mites

The residual action of methoxychlor in sheep wool is sufficient to paralyze sheep keds in two hours as long as 6 weeks after a sheep was dipped in 1% methoxychlor.

Promising results have been obtained in tests against sheep scab mite (psoroptic). It has been reported that a 1% methoxychlor dip completely killed psoroptic mites on 12 head of sheep.

Dog and Cat Fleas

Numerous tests on dogs and cats have shown that fleas can be controlled by 5% to 10% methoxychlor powder or 0.5% dip.

Residual Activity

WHEN used as a spray on cattle at a concentration of 0.5%, methoxychlor will be effective normally for at least three weeks. If the animals are isolated from other animals, they may not have to be re-sprayed for 60 days or longer.

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Members of the panel discussing "More Corn For America." Names of participants appear on desk.

NFA Breaks Records at 26th Annual Convention

A RECORD-BREAKING attendance of nearly 700 was on hand for the National Fertilizer Association's 26th annual convention held June 11-13, at the Greenbrier Hotel, White Sulphur Springs, W. Va. The group heard the annual addresses of the NFA president and chairman of the board, and talks by Edwin G. Nourse, E. J. Condon and Senator Clinton P. Anderson in addition to a panel on "More Corn for America" discussing the role of fertilizers in achieving greater yields of this crop.

Board chairman J. E. Totman, Summers Fertilizer Works, Baltimore, Md., told the group in his address, that the fertilizer industry will be able to supply American agriculture with sufficient quantities of plant food during the coming season, although there are some unfavorable supply conditions involved. The lack of sulfur, he said, will affect the superphosphate supply for the coming season although every effort is being made to recover spent acid and waste acid and to reclaim sulfur from natural gas and smelter fumes. These latter methods will

probably not be developed in time to help out in the coming season, he said. (Full text of Mr. Totman's report appears on page 57, this issue)

The panel discussing "More Corn for America", meeting on June 11, was an open meeting of the Plant Food Research Committee's Corn Subcommittee. Chairman was Proctor W. Gull, Spencer Chemical Co. agronomist and others on the panel included: Borden S. Chronister, chief agronomist, Southern Division, Barrett Division of Allied Chemical & Dye Corp., Murry C. McJunkin, northeastern agronomist of the Coke Oven Ammonia Research Bureau; and George V. Taylor, director of market research, Spencer Chemical Co.

Dr. Gull introduced the topic, reviewing the history of corn raising from early times when the American Indians grew maize up through the years to the present era of hybrid corn raising. He was followed by Dr. McJunkin who told of new methods of getting information down to the farmer level so he can increase his yield. Slides were shown

illustrating the steps a grower should follow in stepping up his corn production. These included the use of a well-adapted hybrid, adequate fertilization, adjustment of the corn population to the soil's fertility level, controlling weeds and making yield checks regularly to determine what method is most productive.

Mr. Chronister stated that already enough is known about increasing yields to much higher levels, but difficulty is sometimes encountered in getting this information to the actual grower. He pointed out that research without extension is inadequate, and that corn production could be increased three-fold if present knowledge were utilized universally. He emphasized the need for mass education of farmers and as an illustration pointed out the success of "hundred bushel" clubs composed of farmers who had produced that quantity of corn per acre through better fertilization and other cultural methods. Mr. Chronister declared that any farmer who desires to do so, can produce 100 bushels of corn per acre.

Mr. Taylor presented to the

group a comprehensive collection of charts and graphs showing population trends in the U.S., the money spent for various foods in the nation, the per capita consumption of plant food and how fertilizer, lime and seed fit into the total cost of food production. He pointed out that many growers do not know their actual costs of raising a given crop such as corn and hence may not appreciate the important but relatively inexpensive role played by fertilizer in agricultural production.

Fertilizer Vs. War

C LINTON P. Anderson, former Secretary of Agriculture of the United States and now senator from New Mexico, reminded that the only basis for future security on a national or a world-wide scale, is in an adequate food supply. He reviewed the basic motives behind world wars I and II as being a desire to gain more land on which food might be produced. "What really caused the unrest which drove the Japanese into the desperate and ill-fated gamble for empire?" he asked. "With some 70 million people jammed into their tight little islands, they simply could not produce what they needed. So they reached out for allies and drove for conquest of land areas which could produce food and trade goods." He pointed out in passing, that Japan may become a danger spot again since the population there has increased to about 83 million, which means that she must yet find a way to feed this population adequately.

Italy also faces hunger, the senator pointed out. It was this basic need for food that impelled the Italian people to follow Mussolini in his grab for empire in Africa. The same problem was true in Germany, he reminded. Other countries closer to home face similar problems. These include Mexico, Puerto Rico in particular, the latter having a population density of 600 persons per square mile as compared to only 50 on the U.S. mainland.

"This population problem is world-wide, and we must think of it

In the Photos

R. S. Rydell, Swift & Co., Chicago; Joe E. Culpepper, Spencer Chemical Co., Kansas City, Mo. and Dr. H. B. Siems, Swift & Co., Chicago.



C. G. Thompson, Smokey Mountain Fertilizer Co., Waynesville, N. C.; F. D. Hoexter, Associated Metals & Minerals Corp., New York; Alex M. McIver and son, H. H. McIver, Alex M. McIver Sons, Charleston, S.C.



T. W. Allen, Sand Mountain Fertilizer Co., Attalla, Ala.; C. J. Ball, Phillips Chemical Co., Norfolk, Va.; J. E. Nunnally, Cotton Producers Association, Atlanta, Ga.; and M. E. Hunter, The Barrett Division, Allied Chemical & Dye Corp., Richmond, Va.



Mrs. J. H. Epting, Mrs. H. Gordon Cunningham, Mr. Cunningham, Tennessee Corp., Atlanta, Ga.; Betty Epting and Mr. Epting, Epting Distributing Co., Leesville, S. C.





Photos above: Top row, L to R: Wayne H. Lowry, International Harvester Co., Chicago; A. F. Miller, Swift & Co., Chicago; Richard F. Messing, Arthur D. Little, Inc., Cambridge, Mass.; Ray E. Neidig, Balfour Guthrie & Co., Ltd., San Francisco, Calif. and E. B. Helgeson, Magnolia Fertilizer Co., Seattle, Washington. (Center) David D. Long, International Minerals & Chemical Corp., Chicago; J. Rucker McCarty, International Minerals & Chemical Corp., Atlanta; H. Baylor, Charles Town, W. Va.; A. H. Sterne, Tennessee Corp., Atlanta; and Ray L. King, Georgia Fertilizer Co., Valdosta, Ga. (R) T. W. Allen, W. H. Appleton, Potash Company of America, Atlanta, Ga.; Mrs. Appleton; W. W. Bel-

ser and R. M. Maxwell, U. S. Steel Co., Pittsburgh, Pa.

Second row: NFA president Russell Coleman and H. B. Mann, Claude Byrd, Spencer Chemical Co., Kansas City; L. G. Black, Ark-Mo Plant Food Co., Walnut Ridge, Ark.; R. M. Pitcher, Colorado Plant Food Co., Rocky Ford, Colo. and John R. Riley, Jr., Spencer Chemical Co., Kansas City. (R) J. E. Totman, who presided at speaking sessions, on platform while E. J. Condon speaks. J. F. Corkill and James A. Naitel, both of Pacific Coast Borax Co., New York and Auburn, Ala., respectively.

Third row: General scene at horseshoe-pitching contest, showing some of spectators; John G. Reynolds, Bethlehem

Steel Co., Bethlehem, Pa.; Murry McJunkin and H. H. Tucker, both of Coke Oven Ammonia Research Bureau, Columbus, Ohio; and H. F. Shelly, Bethlehem Steel Co., Bethlehem, Pa. (R); G. W. Shelhammer, Union Bag & Paper Corp., Chicago; H. B. Siems; Philip Shuey, Shuey & Co., Savannah, Ga.; and John C. Mosar, Sturtevant Mill Co., Atlanta, Ga.

Bottom row: Mr. & Mrs. W. R. Morgan, International Minerals & Chemical Corp., Chicago; Thomas Morgan, AGRICULTURAL CHEMICALS; and Mr. & Mrs. Tom Ware, International Minerals & Chemical Corp., Chicago. (R) Mr. & Mrs. Travis S. Whitsel, Union Special Machine Co., Chicago, Ill.

AGRICULTURAL CHEMICALS

In the Photos:

Top row, (L to R) Judge D. S. Murph, retired secretary of NFA; Wm. S. Ritter; Dorothy Freyeisen and Miriam C. Vance, all of NFA staff. (Center photo) T. W. Grady, North American Fertilizer Co., Louisville, Ky.; George V. Savitz, International Minerals & Chemical Corp., New York; Wm. Lehmann, Chilean Nitrate Sales Corp., New York; and Judge Murph again. (R) Rodney C. Berry, president, American Association of Fertilizer Control Officials, Richmond, Va.; and B. D. Cloaninger, Clemson, S. C., past president of A.A.F.C.O.

Center row: H. R. Krueger, Phillips Chemical Co., Bartlesville, Okla.; Charles A. Woodcock, St. Regis Paper Co., Chicago; Arch Carswell, St. Regis Paper Co., New York; and John F. Gruber, St. Regis Paper Co., Baltimore, Md. (Center)

Ira P. MacNair, "Agricultural Chemicals," New York; Governor Elbert N. Carvel, Valiant Fertilizer Co., Laurel, Del.; Gus Ashcraft, Ashcraft-Wilkinson Co., Atlanta, Ga.; and Trenton Tunnell, also of Ashcraft-Wilkinson. (R) President-emeritus J. W. Turrentine, American Potash Institute, Washington, D. C. and its present head, Dr. H. B. Mann.

Bottom row: LeRoy Donald, Lion Oil Co., El Dorado, Arkansas; Kinchen O'Keefe, Southern Agricultural Fertilizer Co., Clarksdale, Miss.; and Mr. & Mrs. M. G. Field, Meridian Fertilizer Co., Hattiesburg, Miss. (Center) Mr. & Mrs. Doyle Patterson, Farm Belt Fertilizer & Chemical Co., Kansas City, Mo.; and Mr. & Mrs. L. G. Porter, U.S.D.A., Washington, D. C. (R) Niel Bass, Tennessee Valley Authority, Wilson Dam, Ala.; Rep. Thomas Abernethy; and Senator Clinton P. Anderson, New Mexico, former Secretary of Agriculture.

in world-wide terms", Mr. Anderson declared. Each day we are reminded that the whole world has shrunk and we cannot afford to limit our consideration to any one country or even one hemisphere. It should be pretty obvious that we cannot enjoy isolation in any sense. What happens in Asia today affects us as surely as if it happened next door.

"Three hundred years ago there were about $\frac{1}{2}$ billion people in the whole world. Today there are two and a third billion — an increase of almost five times. The world's population has more than doubled in the last century. In recent decades and in spite of two world wars, the population has been increasing at the rate of about one percent each decade."

(Continued on Page 99)



Agricultural Crop Yields Gain Tremendously through Use of Pesticides

TERMINOUS gains in crop yields result each year from the use of insecticides throughout the United States. The extent to which growers depend upon the use of pesticides in the production of food and fibre can be illustrated by a few examples of widespread infestations which have been controlled successfully by use of chemicals. Insects take a continuous toll of agricultural crops. The abundance of these insect pests varies because of weather and other conditions so that periodically they attain epidemic proportions and cause tremendous crop losses. To combat these pests successfully, enormous quantities of insecticidal formulations are required. The estimated expenditure for insecticides *per se* in 1948 was about 60 million dollars and most of this was used to control pests attacking agricultural crops. Since growers realize that insecticides represent a major item of cost, they do not use more than the amount necessary to produce good crops. Some of the outstanding benefits derived from insecticides in recent years are noted here to indicate the great impact that these chemicals have on our agricultural economy.

Codling Moth Control Pays

FRUIT insects must be controlled for the grower will go out of business. If it were not for insecticidal control of various apple pests, production would be greatly curtailed and much of the fruit reaching the market would be unfit for human consumption. Apple growers formerly spent \$100 an acre for the control of these insect pests. The al-

ternative is a wormy crop and when this reaches 30 to 40 percent, particularly in years of fairly low prices, the crop is practically a total loss. Before the advent of DDT the annual loss figure attributed to the codling moth, alone, was placed at 50 million dollars.

Beginning in 1946, DDT replaced older insecticides in the insect control spray schedules in all except the most northern apple-producing areas. The rapidity with which DDT came into use and displaced older materials is indicated by observing the number of pounds of insecticides used in the Yakima Valley, Washington, from 1945 through 1948. These figures are as follows:

Year	Lead Arsenate	Cryolite	50 Percent DDT
1945	3,942,000	6,744,000	700
1946	6,121,000	5,573,000	673,000
1947	92,335	398,000	2,613,000
1948	24,640	87,323	1,825,000

Because of the great effectiveness of DDT against the codling moth, the average number of cover spray applications has been reduced from seven or eight to four. Prior to the availability and use of DDT, annual apple losses due to the codling moth amounted to about 15 percent of the crop value; now it averages about 3 to 5 percent. In spite of the general use of DDT, losses attributable to the codling moth for the years 1944 to 1948 amounted to \$9,176,000.

Borer Control Benefits

DEVELOPMENT of inexpensive, easily-applied insecticides (paradichlorobenzene ethylene di-

chloride or propylene dichloride) now used throughout the country for the control of the peach tree borer has enabled growers to realize an annual profit of about three million dollars. Heretofore, this insect either weakened or killed peach trees and reduced the profitable life of the orchards by as much as 50 percent.

Grasshopper Control

GRASSHOPPERS are destroyers of a wide range of crops. Their abundance and destruction varies widely—both geographically and from year to year. In the summer of 1948, about 8,700,000 acres of crops and pasture lands in the

central, midwestern, and western states valued at \$68,000,000 were protected from grasshopper damage through the use of control measures, principally insecticides. In 1949, the value of crops destroyed by grasshoppers was estimated at 27 million dollars whereas the value of crops saved by insecticidal control was placed at 72 million dollars—a saving of \$45 for each control dollar spent.

These savings were predicated upon research studies and practical field tests that showed chlordane and toxaphene to be highly effective for the control of many species of grasshoppers under a variety of conditions. Procedures have been developed that permit the use of these mater-

by

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U. S. Department of Agriculture,
Washington 25, D. C.

ials without appreciable risk from the residues left on the crops. Experience with these materials to date leaves little doubt that they can be used effectively and without creating a health hazard. Care should be taken, however, to see that minimum dosages are used, applications properly timed, and an effort made to keep the grasshopper population suppressed to the point where only a minimum number of insecticide applications are necessary.

A relatively new insecticide, aldrin, in dosages of one to two ounces of the technical material per acre in one or two gallons of solvent, has afforded a high degree of grasshopper control on crops and range lands. Over 3 million acres of crop land were treated during 1950 in Canada, and it was used successfully in cooperative experimental programs in the United States. The total per acre cost for the treatment is approximately 70 cents—a rather small expenditure for the protection of important crops that otherwise might be totally destroyed.

Greenbug Controlled

IN 1950 over a million acres of small grain in Oklahoma, Texas, and Kansas became heavily infested with greenbugs that occurred in outbreak numbers and threatened to destroy the crops. Fortunately, experimental work showed that parathion was effective against this pest for which there was no previously known practical control. Preliminary field tests were so successful that many growers made applications with ground equipment or sought the services of commercial operators

using aircraft to treat their fields with this insecticide. It is estimated that the control of this outbreak saved farmers several millions of dollars and made available large quantities of needed small grains.

Assuming that 653,936 acres of wheat were treated with insecticides that resulted in an increase of 4 bushels per acre, the Oklahoma wheat crop was increased by 2,615,744 bushels. At \$2 per bushel, this wheat would have been worth \$5,213,488. Farmers expended approximately \$1,307,872 in making the insecticidal application, thus a net increase of \$3,923,616 was obtained. Of course the cost of harvesting these additional bushels should be considered. Although it is difficult to separate greenbug losses from that of drought, the most reliable estimate places the greenbug loss at approximately 22 million bushels of wheat, 2 million bushels of oats, and 800,000 bushels of barley.

In one series of field tests in Louisiana, nearly twice as much sugar per acre was produced by killing soil-inhabiting wireworms with insecticides. Soil infested with these pests produced only 27 tons of sugarcane, and 4,500 pounds of sugar per acre, while treated soil in which the wireworms were killed produced nearly 47 tons of cane and over 8,000 pounds of sugar per acre.

The finely ground stems of the ryania plant have been found to be as satisfactory as cryolite for the control of the sugarcane borer in Louisiana. This material was first recommended for grower use in 1950 and gave good control of the borer on over 5,000 acres of sugarcane

treated for the control of this pest.

Another example concerns control of Velvetbean Caterpillars, one of the most widespread and intense outbreaks of which occurred in 1946. The prompt application of several insecticides reduced the losses to several crops. Dust mixtures containing from 2.5 to 3 percent DDT applied at rates of 12 to 20 pounds per acre gave faster action against the caterpillars than cryolite or calcium arsenate and resulted in generally higher control. The cooperative control program between Federal and State agencies and the growers resulted in an estimated saving of \$10,000,000 to the growers of peanuts in Georgia, \$5,000,000 to growers of peanut and soybean crops in Alabama, and \$50,000 to producers of soybeans in South Carolina.

Corn Losses Reduced

THE corn earworm is one of the most destructive insect enemies of ear corn and occurs throughout the United States wherever corn is grown. It is practically impossible to grow sweet corn in the south without the use of insecticides to control this insect. Even in the north the losses are heavy. Now, however, growers can save from 60 to 90 percent of their crops from corn earworm damage by use of machine applications of oil emulsion sprays containing insecticides. Although field corn is not so severely injured, it has been estimated that 2 percent of this crop is destroyed annually by the earworm. Conservatively estimated, the loss to the field-corn crop, alone, amounts to more than \$75,000,000 annually. Thus, the American farmer grows approximately 2,000,000 acres of corn each year to feed the earworm unless measures are taken to control it.

The European corn borer caused a loss to corn growers of nearly \$5,000,000 in 1941. Subsequently, the pest invaded new territories until, in 1948, there were 29 States known to be infested. In 1948,

*Excerpt from testimony presented before Delaney Committee, May 22, 1951.

losses from the corn borer exceeded \$103,000,000 of which sweet-corn growers suffered more than \$4,000,000 damage. The total loss of corn in 1949 was about 349,635,000 bushels as compared with nearly 100,000 bushels lost in 1948. Fortunately, the damage during 1950 was much reduced. Insecticides are known to be effective against this insect and must be used if growers in many areas are to produce a profitable crop of corn.

DDT and Potato Yields

POTATO producers in the United States find it necessary to use insecticides to protect their crops from insect defoliators such as the Colorado potato beetle and flea beetles, as well as from psyllids, leafhoppers, and aphids that suck out the plant juices. Other pests—including wireworms, potato tuberworm, and the tuber flea beetle—either destroy the tubers or lower the grade because of feeding scars. Potato production may also be seriously affected by diseases that are transmitted by aphids, psyllids and leafhoppers. Certain of these insects occur each year in destructive numbers while others may be limited to particular regions and cause damage periodically.

Fairly good control of the above-mentioned pests has been obtained for many years with arsenical, nicotine, and rotenous insecticides. However, it was not until DDT was generally used on the potato crop that production on a per-acre basis increased materially. In 1945 the average yield of potatoes in the United States was 155 bushels per acre. In 1946, largely because of the use of DDT, the yield was 186 bushels—and it increased yearly until, in 1949, it was 211 bushels per acre. In Maine, the production of potatoes rose from 261 bushels per acre in 1945 to 450 bushels per acre for 1949.

Tomato Yields Increased

IN California, during 1949, approximately 66,500 acres of tomatoes were treated by airplane with 10 percent DDT dust at 6⁶ pounds

per acre, for the control of the tomato fruitworm, using 4,322,500 pounds of a DDT insecticide. A total of 18,408 acres were treated with sulfur for tomato russet mite control, using about 460,000 pounds of sulfur.

Without this treatment for mite control it would be impossible to produce a normal crop of tomatoes in California, and it is to be expected that a 15 to 25 percent loss of tomatoes would occur from tomato fruitworm damage.

Reduction in Weevil Losses

DURING 1949-1950 3,840 Louisiana growers dusted 306,020 bushels of seed potatoes with 48,416 pounds of 10 percent DDT. In addition, 1,580,055 bushels in 231 commercial storages were dusted with the same material. As a result of control activities it is estimated that the weevil losses in the Louisiana control areas, alone, were reduced 2-1/4 million dollars since 1946. The growing of dried peas in which the pea weevil developed in the same area with green peas resulted in a heavy infestation of the green market product with weevil grubs. It became necessary for the seed-pea industry and the dried-pea industry to move from the East to the West Coast because of the pea weevil infestations. However, the pea weevil soon became a pest of dried peas in the West and infestations of from 70 to 90 percent of green peas occurred in some untreated fields. Fortunately, the United States Department of Agriculture developed insecticide control methods that enabled processors of green peas to market a product that would not be subject to condemnation because of wormy peas. The development of effective control measures eliminated the pea weevil threat to the essential canning and frozen food industries in Washington, Oregon, Utah, and Idaho.

Increases of Milk, Beef

HORNFLIES cause damage chiefly through depletion of blood of the animals and through irritation and annoyance. Dairy cattle

lose weight and there is a decrease in milk production of at least 10 percent during severe hornfly seasons. Pyrethrum and methoxychlor insecticides give complete control at a nominal cost.

On the livestock front, the importance of controlling hornflies, lice, stable flies, and other pests was demonstrated in a recent test in Kansas where 8,000 range cattle in 16 counties were treated with DDT. The added gains in weight for the treated animals ranged from 17 to 131 pounds a head or, roughly, an average of 50 pounds. Kansas cattlemen figure that 5 cents worth of DDT per steer gave a gain worth around \$10. It is estimated that Colorado farmers and ranchers, in a single recent year, gained more than \$4,500,000 as a result of treating 1,638,730 cattle, sheep, and hogs to control insect infestations.

Cotton Insect Control

THE value of using new insecticides for cotton insect control was demonstrated in two community-wide experiments undertaken by the Department in central Texas in 1949. Nineteen adjoining fields in one community were dusted or sprayed with insecticides. Fourteen fields in another nearby community received no insecticide dusts. The yield in lint cotton was 415 pounds per acre from the treated fields as compared with 178 pounds from the untreated fields. The net profit was about \$54 per acre.

A similar large-scale test carried out in 1950 gave an average net gain of \$74.84 per acre. It is obvious that if this type of control had been applied to the entire heavily infested cotton area that we would not now be faced with the present shortage of urgently needed cotton.

In 1950, a year of heavy boll weevil population, cotton farmers put up a good—but expensive—fight which, however, turned out to be highly profitable. The use of calcium arsenate, alone, or one of the new organic insecticides—or in combination—enabled some farmers to make a bale per acre. In some sections, (Turn to Page 105)

American Plant Food Council Speakers Place Emphasis on

Fertilizer's Importance to U.S.

THE increasingly important role of the fertilizer industry as a key to success in maintaining democratic principles was emphasized at the 6th annual meeting of the American Plant Food Council at the Homestead Hotel, Hot Springs, Va., June 14-17. Addressees by Secretary of Agriculture Charles F. Brannan, APFC president Paul T. Truitt, and by Senators Allen J. Ellender and Karl E. Mundt keynoted this theme.

The schedule for the first day of the convention included registration, and a meeting of the APFC board of directors in the evening. Opening the convention proper on June 15, W. T. Wright, F. S. Roys-

ter Guano Co., Norfolk, Va., chairman of the executive committee presided and introduced the speakers of the morning.

President Truitt, in his debut before the group, declared that the best way to kill off foreign ideologies is to do it with a "full dinner pail" and an abundance of good living. He emphasized further that "fertilizer is a key factor in a plentiful food supply.

"Fertilizers bring more abundant

production which in turn reduces the high cost of living," he said. "The public must be made to understand the 'why and wherefore' of its food supply. The importance of abundant use of fertilizer and other sound land management practices must be understood by the public as a whole before this (the fertilizer) industry can make its greatest contribution to the public welfare.

"Consumers may have to tighten their belts, but not because the fertilizer industry is unwilling to produce and distribute plant food needed to grow large crops or because the farmers are unwilling to cooperate. This industry will produce the

Members of panel appearing at Homestead. Front row, (L to R): President Paul T. Truitt; Secretary Brannan; Paul T. Sanders and Fannie Doering. Standing (L to R): Robert A. Wall; Edwin Bay; Dr. R. Frank Poole and Phil Alampi.



In the photos below: (Top row, L. to R.): Three members of the APFC executive committee chat with Pres. Truitt. They are: C. Cecil Arledge, Va.-Carolina Chemical Corp., Richmond; George E. Pettit, Potash Company of America, New York, chairman; John V. Collis, Federal Chemical Co., Louisville, Ky., and Paul T. Truitt. At right is W. T. Wright, master of ceremonies at banquet.

Second row: James R. Rossman, president, Woodruff Fertilizer Works, Inc., North Haven, Conn., and Kenneth D. Morrison, president, Naco Fertilizer Co., Charleston, S. C. At banquet speakers' table: Fannie Deering, Mrs. H. E. Myers, Manhattan, Kansas; Rep. Harold D. Cooley, N. Carolina, chairman of the House Agriculture Committee; and Mrs. C. Cecil Arledge.

Third row: W. B. Porterfield, U. S. Potash Co., Richmond, Va., and A. J. Dickinson, V-C Corp., also of Richmond.

Mr. Porterfield was a member of the convention hospitality committee, and Mr. Dickinson was chairman of the tennis committee. James F. Doetsch, president, Chilean Nitrate Sales Corp., New York; and Ralph B. Douglass, president, Smith-Douglass Co., Ind., Norfolk, Va. Mr. Douglass was chairman of the Council's first executive committee.

Bottom Row: Louis H. Wilson, secretary and director of information of the APFC; Paul D. Sanders and Fannie Deering. A. Douglas Strobar, president, Southern Fertilizer & Chemical Co., Savannah, Ga.; Omar Sanders, Fertilizer Industries, Inc., New York; Edwin Bay, president, National Association of County Agricultural Agents, Springfield, Ill.; I. G. Porter, Fertilizer Division, U.S.D.A., Washington, D. C.; and John Heimburger, General Counsel, House Agriculture Committee, Washington, D. C. (All photos this page by American Plant Food Council)



kinds and quantities of plant foods farmers demand, insofar as the supply of raw materials and scientific knowledge will permit."

Mr. Truitt, viewing the outlook for fertilizers, reported "there is considerable well-informed opinion in the U.S. Department of Agriculture that the demand for and use of plant foods will double in the 1950-60 decade." He said that already "expansion is taking place in the nitrogen and potash fields," but called attention to the present shortage of sulfur and sulfuric acid, which is "vexing agriculture, Government and the industry alike."

"In its relatively short history, the fertilizer industry has made an enviable record of achievement," he said, pointing out that during the past decade the use of commercial fertilizers "has more than doubled—in fact, almost tripled."

Following president Truitt on the program, was Senator Ellender, chairman of the Senate Agriculture Committee, who told the convention that "tampering seriously with the present basic farm program would be a little short of national suicide" and defended the economic position of the farmer who he said has become a "whipping boy" and "the victim of the most unjust smear campaign of modern times."

In his address, titled "Agriculture—Our First Line of Defense", the Senator charged that pressure groups have concentrated on the farmer and have tried to attribute to him all the guilt for present-day high prices. He emphasized that "there is no earthly reason why the farmer should not be afforded some protection in our economy and certainly he is entitled to a living wage, but he is powerless to deal effectively in the market-place with the highly organized interests opposing him."

"It was because the farmer is more or less helpless to cope with the odds against him that the Congress saw fit to lend him a helping hand," the Senate Agriculture Committee Chairman said. "Unless and until a better (farm) plan can be formulated, we will do well to stay with

and improve the present one," he said. "We should improve it as the needs from year to year change, but any radical alteration of the present system would be most unwise, to say the very least. I base my conclusions upon one major premise: we must maintain a strong agricultural economy. The history of the world is replete with nations which have permitted their agriculture to wither away. England is a prime example. It has been said many times before that agriculture is the bedrock of our national existence and continued leadership. We must keep agriculture strong and healthy."

Senator Ellender termed the fertilizer industry "one of the most vital groups in our whole program" emphasizing that in backing up the farmer with the means of maintaining and increasing his yields, fertilizer manufacturers are the key men behind the key men."

"To my mind," he continued, "the dilemma that faces the farmer can be solved only by one method. That is by a substantial increase in

Eight new members were elected to the Board of Directors of the American Plant Food Council at the convention for terms expiring June 30, 1954, as follows:

C. B. Clay, Cotton States Fertilizer Company, Macon, Ga.; J. C. Grissey, G.L.F. Soil Building Service, Ithaca, N. Y.; Wallace B. Hicks, Wilson & Toomer, Jacksonville, Fla.; R. R. Hull, I. P. Thomas & Son Company, Camden, N. J.; Kenneth D. Morrison, Naco Fertilizer Company, Charleston, S. C.; John R. Riley, Jr., Spencer Chemical Company, Kansas City, Mo.; J. A. Roberts, Pioneer Phosphate Company, Des Moines, Iowa; and M. W. Whipple, Olds & Whipple, Inc., Hartford, Conn.

Paul Prosser of The Baugh & Sons Company, Baltimore, Md., was elected to fill the unexpired term of W. S. Rupp, retired executive of the same firm, expiring June 30, 1952.

Members of the Executive Committee of the Council, were elected as follows:

George E. Pettit,* Potash Company of America, Washington, D. C.; C. Cecil Arledge, Virginia-Carolina Chemical Corp., Richmond, Va.; John V. Collis, Federal Chemical Company, Louisville, Ky.; C. B. Robertson, Robertson Chemical Corp., Norfolk, Va.; John E. Sanford, Armour Fertilizer Works, Atlanta, Ga.; and W. T. Wright (ex officio member) F. S. Royster Guano Company, Norfolk, Va.

*Chairman of Committee.

Photos below:

Top row, L to R: J. M. Rawlings, F. S. Royster Guano Co., Montgomery, Ala.; James F. Doetsch, Chilean Nitrate Sales Corp., New York; W. T. Wright, F. S. Royster Guano Co., Norfolk; and Thomas Abernethy, House Agriculture Committee, Washington, D. C. (R) Seated: Joseph A. Howell, president, Virginia-Carolina Chemical Corp., Richmond, Va. and George E. Pettit, Potash Co. of America, chairman of the APFC executive committee. (Standing) A. B. Jackson, Anderson Fertilizer Co., Inc., Anderson, S. C.; Edwin Pate, Dixie Guano Co., Laurinburg, N. C.; Edward Smith, Ed. Byland, V-C Corp., Richmond; and H. B. Mann, president, Potash Institute of America, Washington, D. C.

Second row: Ed. Phillips, GLF Soil Building Service, New York; Harold C. Haase, Ochoa Fertilizer Corp., New York; R. B. Lenhart, GLF Soil Building Service, New York; and John W. Hall,

Potash Co. of America, Washington, D. C. Right: American Cyanamid Co. group at lunch at Casino. (L to R): Ralph F. Allen; Paul Shafer; William J. Rabel; Frank H. Cappy and C. M. Nesbitt.

Third row: Richard W. Goldthwaite, Lion Oil Co., El Dorado, Ark.; W. E. Shelburne, Armour Fertilizer Works, Atlanta, Ga.; B. M. Machen, Lion Oil Co. and W. H. Appleton, Potash Co. of America, (R) Herbert Reppen, Southern Fertilizer & Chemical Co., Savannah, Ga.; F. R. Ansprech, I. P. Thomas Co., Camden, N. J.; and W. W. Harley, So. Fertilizer & Chemical Co., Savannah.

Bottom row: Group of ladies from party "between times" at convention. (R) Sen. Allen J. Ellender, Washington, D. C.; S. K. Bradley, Union Bag & Paper Co., New York; J. A. Monroe, Smith-Douglas Co., Norfolk; and R. C. Simms, Thurston Chemical Co., Joplin, Mo.



the efficiency of American farming. And the primary method of increasing farm efficiency is by increasing the soil productivity."

Senator Ellender asserted "the most practical way of increasing production over the next few years . . . is by heavier application and wider use of fertilizers," adding that "our soil must be kept up at all costs."

"Today," he continued, "15 percent of our population lives on farms and works in agricultural pursuits for 6 percent of the national income. Unless we bolster the position of the American farmer, this percentage will shrink yet more and more and some day our country will awaken and find itself critically short of basic food and fibre products."

Senator Ellender re-emphasized that "our soil must be maintained at all cost," and asserted "fertilizer is one of the tools that will enable us to do the job of keeping our fields fertile and our farms productive."

Dr. H. E. Myers, head of the agronomy department, Kansas State College at Manhattan, addressed the convention following Sen. Ellender. Dr. Myers declared that "if the human dietary level is to be improved, livestock products must be increased" and emphasized "fertilizers play a big part in quantity (feed) production" necessary to reach the goal. He spoke on "Fertilizer Use in Relation to Animal Nutrition."

"Crops are produced largely as food for humans either directly or indirectly," Dr. Myers said. "Satisfactory nutritional standards for the human race call for increased consumption of animal products. The

human population of the world has increased and is continuing to increase at a relatively rapid rate. Therefore, even to maintain the proportion of animal products in the human diet as it now exists, it is necessary that the production of livestock products be increased. If the human dietary level is to be improved, livestock products must be increased still further. In order to increase livestock products in the United States it is necessary to increase the total feed supply. Most of the increase in feed production must of necessity come from acres already in production", he said. This line of reasoning suggests that one of the most important considerations, so far as the effect of fertilizers on the livestock feed problem is concerned in relation to human nutrition, is to increase the total feed production as well as its quality."

"An inadequate total digestible nutrient intake (by farm animals) can be corrected by an increase in the quantity of feed crops produced," Dr. Myers said. "Fertilizers play a big part in quantity production. Low protein content may be corrected by producing legumes by applications of fertilizer and lime."

Brannan Looks Ahead

SECRETARY of Agriculture Charles F. Brannan was the first speaker of the Saturday morn-

Below, (L to R): President Truitt delivering his address; Warren Belser and C. M. Nesbitt, American Cyanamid Co. Senator Ellender as he addressed the convention; Dr. Myers during his talk; and Mr. & Mrs. Rodney C. Berry, Richmond, Va.

ing session. He emphasized the importance of having an adequate supply of fertilizers and insecticides, the farmer's tools of production, to produce enough food and fibre to meet the demands of the times. He said that the U.S.D.A. is working to assist private industry to increase nitrogen fertilizer production, and added that "it is conceivable that in an extreme emergency, additional plant capacity could be built by the Government as was done in World War II", but the Secretary emphasized that "it goes without saying that the Government prefers that private industry carry the ball" and the Department will give what help it can to private industry in getting the job done. (The secretary's complete text will appear in the July Issue.)

Forum on Fertilizer

DISCUSSING "Fertilizer's Contribution to Better Living", a six-man panel was featured as the second half of the Saturday morning program. Introduced by Louis H. Wilson, secretary and director of information for the Council, Dr. Paul D. Sanders, editor of *The Southern Planter*, Richmond, Va., acted as moderator. The forum featured addresses by the officials of the American Agricultural Editors' Association, of which Dr. Sanders is a past president; the Association of Land-Grant Colleges and Universities, National Association of Radio Farm Directors, National Association County Agricultural Agents and National Vocational Agricultural Teachers.

(Turn to Page 95)



**F. G. Morales, manufacturer
and dealer, sets pace for**

Use of Pesticides in Cuba

WITH the use of insecticides so firmly established as an indispensable part of the agricultural economy in the United States, it is sometimes difficult to realize that in some other parts of the world, pest control is still in its infancy. In Cuba, for instance, the history of insecticidal application is so relatively short that one of the first pioneers in agricultural pest control is continuing to do a flourishing business in Havana. He is Frederico G. Morales, who manufactures and sells pest control materials and acts as an effective educational medium throughout the entire island area. A subscriber to *Agricultural Chemicals* and to the bulletins of various agricultural experiment stations of the U.S., he translates much of the technical information into a form under-

standable to the Cubans, reprints it and distributes it widely. Thus, the science of controlling agricultural insects and plant diseases is being propagated at an increasing rate through the efforts of this manufacturer.

Mr. Morales stated in a recent interview that he has been applying nicotine dust since about 1921 and mixing insecticidal dust since 1928. During the intervening

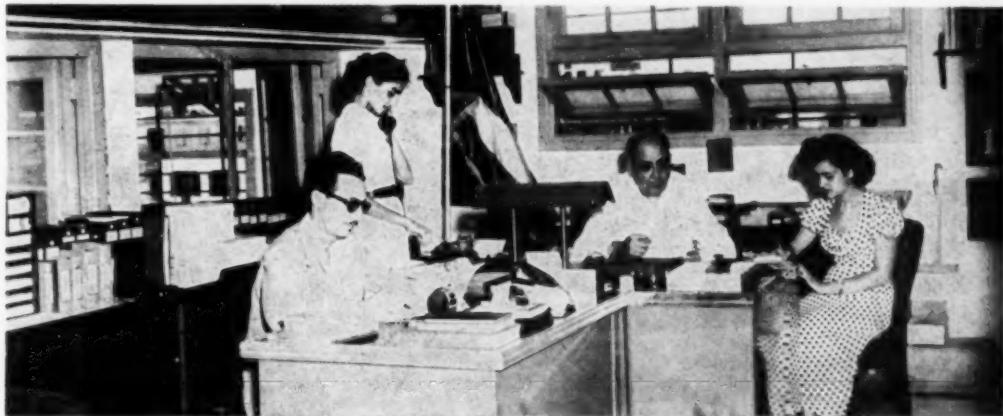
years he has played an important part in the development of the Cuban pesticide industry, as his thriving business attests.

Insect problems in Cuba are numerous, due largely to the climate. In fact, it was just this problem which pushed him into the insecticide business. Following the family tradition of more than 200 years in agriculture, Mr. Morales discovered that insects were his greatest problem in crop raising. The citrus black fly defied all efforts at control, so the young agriculturist boarded a ship and made inquiry in the U.S. about control of this and other pests. The information gained from this trip inspired him to tell others about the insecticides, and thus Cuba's pioneer got his start.

The present insecticide plant

In the Photo

Mr. Morales maintains an efficient office staff to keep up with the administrative end of the business. He is seated in the center of the photo. The company supplies pesticides for most of the Island community.



NEVER
BEFORE
HAS IT BEEN
POSSIBLE TO KILL
SO MANY INSECTS
ON SO MANY CROPS
AS IT IS TODAY WITH
PARATHION



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in Havana is probably unique in that it boasts a large neon sign which can be seen for miles; operates its mixing facilities in a show-window setup, and does a large-volume retail business directly from the plant. The location is ideal, being at the junction point of three main roads over which hundreds of growers must pass to reach the market. Thus, the big sign and attractive show window play an important part in letting these people know where to purchase insecticides. (Tropical Agriculture, S.A. features "Black Leaf" insecticides made by Tobacco By-Products & Chemical Corp., Richmond, Va.)

Mr. Morales is trying to educate his people in preventive pest control measures. The tendency is to wait until an infestation of insects or plant disease is well under way before doing anything about it. Potato growers, for instance, he says, "wait until blight appears, then they put their hands on their heads in despair and begin telephoning, wiring and hurrying to the store for copper fungicides. And then they just dump it on in desperation!" Mr. Morales states that this type of "control" is gradually being offset by a more calm and scientific approach, but the going is difficult because of the general attitude of the people. They resist sales efforts, having become wary from previous exploitations in other fields, but progress is being made. "Insecticides and fungicides are hardly beginning in Cuba yet", Mr. Morales says. He looks forward to the day when acceptance will be complete and believes that day is not too far off.

In addition to his agricultural interests, Mr. Morales has been an important figure in Cuban politics and civic affairs for many years. Although now retired from politics, he counts among his personal friends presidents, generals and others in high places not only in Cuba but in the U.S. as well. His presidency of the Havana Rotary Club and of the Chamber of Commerce of the Republic of Cuba, plus his active part in international Chamber of Com-

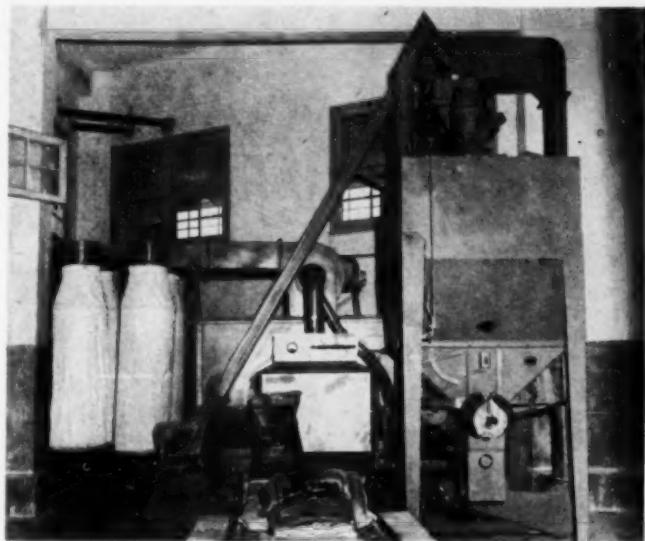
merce activities have combined to make him a well known figure at international gatherings in various parts of the world. He has been made an honorary citizen by mayors of

all of the Gulf Coast cities. His latest honorary citizenship was bestowed on him at the April NACA meeting by the mayor of Miami Beach, Fla.



Exterior view of "Tropical Agriculture, S.A." in Havana. The neon sign, one of the largest in Cuba, may be seen for miles since plant is situated on top of

a hill. Show windows at left enable customers to watch the efficient manufacture of various insecticidal dusts for control of numerous insects in the area.



One of the most important units in the plant is Mr. Morales' blendor, made by A. E. Poulsen & Co., San Francisco. The owner declares that the machine has helped maintain high production at low cost, and also adds to the general

cleanliness of the plant. Mr. Morales keeps up with American advances in pest control and wastes no time in adopting modern ideas and equipment for his own requirements.

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Fertilizer Industry Moving Ahead in '52

by
J. E. Totman

President, Summers Fertilizer Co., Baltimore, Md.
and Chairman of the Board,
National Fertilizer Association

IMPORTANT, almost radical, changes in the general fertilizer set-up characterized the fiscal year just closing. The Korean war and the threat of spreading hostilities have resulted in at least a partial reversion to the conditions and remedial measures of World War II, with an acute situation developing with respect to sulfur supplies.

During 1950, a total of 5,192,184 tons of sulfur were produced and 5,504,714 tons were shipped, the result being that during the year, above-ground stocks were reduced by 312,530 tons. The alarming factor in the situation is that at the close of the year above-ground stocks amounted to less than six months' supply at present shipping rates. Prior to World War II, at the close of 1939, stocks on hand equaled almost two years' supply at the then shipping rate.

In view of the domestic supply situation, with little prospect of bringing into production new or additional sulfur sources for 1951, the Office of International Trade, Department of Commerce, set quotas of crude sulfur for export during the first six months of 1951. The announced total for the half year is 480,000 long tons, not including exports to Canada.

Exports during 1950 totaled 1,086,495 tons, not including 354,501 tons shipped to Canada. If exports during the latter half of 1951 continue at the first-half rate, total exports for 1951 will be only about 100,000 tons less than those for

1950 when no licensing program was in effect. This slight reduction will not make any considerable contribution to the supply for United States industries. Unless there are further reductions in export quotas, sulfur for fertilizer use will continue to be in short supply.

Although sulfur is not the only source of sulfuric acid used in the fertilizer industry, it is, of course, the principal one. Because of the utilization of all possible supplies, including inventories as well as current receipts, the impact of the shortage has not been so critical during the present season as it quite surely will be if the situation continues.

The supply of nitrogen materials was about 20%, and the supply of potash was about 15%, greater than the supplies for the preceding year. Total consumption of all fertilizers in continental United States during the calendar year 1950 was 18,346,000 tons, an increase of more than 11 percent over the preceding year.

Government Controls

GOVERNMENT control of essential materials and supplies has already begun. A sulfur allocation order just issued prohibits the use by anyone of more sulfur in 1951 than they used in 1950.

Sulfuric acid has been placed under limited allocation. Buyers and

users of sulfuric acid in all states must certify to suppliers the end-uses to which this chemical would be put. In the westernmost eleven states, specific authorization by the National Production Authority to use or deliver sulfuric acid is required. In the other states, suppliers must file applications with NPA but may use sulfuric acid, or deliver it to a purchaser who has filed a certificate of proposed use, without express authorization unless otherwise directed by NPA. To date there has been no government allocation of other fertilizer materials.

Controls of steel, copper and aluminum are now scheduled for July 1, with perhaps controls of other materials accompanying or following. On the assumption that the present world conditions will continue, the impact of such controls on the fertilizer industry will become more and more pronounced with the passing of time.

NPA Regulation 4, issued on February 27, permitted business enterprises, under certain conditions, to apply priority ratings to orders for maintenance, repair and operating supplies. On April 16, NPA issued an amendment to the Regulation which canceled, as to certain commodities, outstanding MRO orders bearing priority DO-97, with the result that such items, many of them being of importance to the fertilizer industry, had to be purchased thereafter in the open market. It is now contemplated that under the Controlled Materials Plan a regulation

*Delivered at the 26th Annual Convention
The National Fertilizer Association, White
Sulphur Springs, West Virginia, June 12,
1951.



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For livestock pest control—as a spray. For mange and lice on hogs. Effective kill of lice and mange on dairy cattle, for sheep keds. Also for ticks, lice, horn flies, stable flies and mosquitoes on beef cattle and horses. Also may be used as dust for control of lice on dairy cattle, and lice, ticks, mosquitoes, fleas and horn flies on horses, cattle, hogs and goats as well as sheep ticks or keds. For pest control around milk plants, livestock, dairy barns, etc.



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AGRICULTURAL CHEMICALS

will be issued, effective on July 1, making provision for MRO priorities.

In the early days of the emergency, agriculture was apparently ignored insofar as direct recognition of its needs as compared with the needs of steel, rubber and petroleum industries was concerned. Following urgent protests, agricultural representatives have been appointed as advisors to the administrators of the emergency defense agencies. In addition, four agricultural representatives have been appointed to serve on the President's National Advisory Board on Mobilization Policy.

Price Controls

TO combat rising and inflationary prices, the Office of Price Stabilization, on January 26, issued its comprehensive General Ceiling Price Regulation. It included in its terms manufacturers, wholesalers and retailers and the widest possible range of commodities, including fertilizers. It was admittedly a "stop-gap" order, intended to freeze prices at the December 19-January 23 level pending the issuance of regulations for individual commodities and different levels of distribution.

On April 23, Ceiling Price Regulation No. 22, effective May 28, was issued. (The effective date was later extended to July 2.) This regulation applies to sales of manufactured goods by the manufacturers thereof, except sales at retail and sales of certain specifically exempted commodities. During the first month of this regulation the industry was repeatedly advised by OPS General Counsel that mixed fertilizers sold by manufacturers to consumers through agents were not affected by the order. Later they rescinded this decision and advised that the sale of mixed fertilizers to farmers must comply with the provisions of this order. It is believed that a ceiling price regulation tailored specifically for fertilizers may be in effect before the 1952 season.

Nonmetallic minerals such as sulfur are specifically exempted from the regulation. However, it may be that the exemption applies only to

the ores and not to "commodities produced or processed in whole or in part" from such ores. The OPS has currently ruled that phosphate rock and potash are in this class and are not covered by the order. However, it is assumed that the interpretation is still subject to change.

Another price regulation of interest to the fertilizer industry is CPR-34 which, among other things, provides that a commission agent may apply to currently authorized prices the highest percentage commission rate that he charged on similar transactions during the base period.

Rail Freight Rates

EARLY this year the Interstate Commerce Commission was petitioned to authorize a general 6% increase in rail freight rates. Interim increases of 4% in some areas and 2% in others were authorized by the Commission pending a hearing. These increases had hardly become effective when the railroads requested authorization for additional increases to 15%, this to include the interim increases granted on April 4. Such increases make substantial additions to the cost of fertilizer, and the Association in pursuance of its customary policy, is opposing them vigorously.

Education Continues

THE Association has kept in view its long-term objectives of educational work—the acquiring and dissemination of sound information as to the what, the where, and the how of fertilizer use as the surest way to build an industry that will be successful from its own standpoint and from that of the public it serves. Three events stand out as parts of the continued and continuous development of that program during the closing year.

The book, *Hunger Signs in Crops*, continued to make its appeal to thoughtful persons in agriculture and to fill a need for an easily understood book on plant nutrition. Already more than 50,000 copies of the recently revised edition have been sold, and orders continue.

I can report also that within days the 324-page volume, *The Peanut*—The Unpredictable Legume, will be off the press. This well-illustrated book, prepared by experts in the field, culminates years of work sponsored by the Association's Plant Food Research Committee and brings together, between two covers, the latest information on the production, harvesting and storing of peanuts.

Continuing its visual educational work, the film, *Deeper Acres*, was released in April. This production is designed to demonstrate the feasibility and wisdom of more intensive crop production on land already under cultivation as compared with bringing more land into cultivation.

The "Organic School"

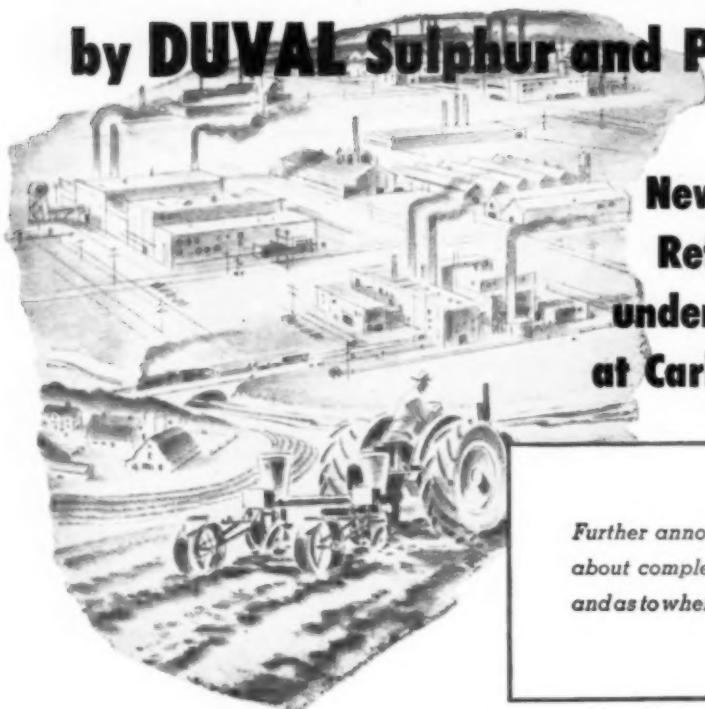
A DEVELOPMENT of special interest to the fertilizer industry, in connection with the fulminations of the so-called "organic school" of fertilizing, took place during the current year. In 1950, the Select Committee appointed by the House of Representatives to investigate the effect of chemicals, including fertilizers, on human health, conducted hearings and heard extensive testimony. Representatives of the fertilizer industry and agricultural scientists, including representatives of experiment stations and agricultural colleges, testified regarding the use and effect of fertilizers. On January 3, 1951, the committee filed its report, in which it said in no uncertain terms:

"No reliable evidence was presented that the use of chemical fertilizers has had a harmful or deleterious effect on the health of man or animal."

This unequivocal statement, made by the Congressional group having as its purpose the study of the point at issue, is a tangible pillar of strength supporting what we have always known to be the truth. The Association's publication *Science vs. Witchcraft* gives the facts as presented by disinterested scientific authorities.

(Turn to page 113)

ANNOUNCING! HIGH GRADE MURIATE OF POTASH WILL BE PRODUCED by DUVAL Sulphur and Potash Co.



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DUVAL POTASH

**FOR BETTER PRODUCTS
OF FARM AND FACTORY**

THE current sulfur shortage in the United States stems directly from our attempt to share our sulfur supplies with the rest of the world. This, essentially, is the view Langbourne M. Williams, Jr., president of Freeport Sulphur Co., outlined at a press conference in New York City, June 12. U. S. production of sulphur which is currently two and a half times the pre-war level, is more than ample to meet all domestic needs. U. S. brimstone production in 1950 was 5,350,000 long tons, he reported. Domestic consumption was only 4,259,000 long tons. The balance of the total sales figure of 5,700,000 tons was accounted for by sales abroad which totaled 1,441,000 tons. Stocks, incidentally, declined 350,000 tons.

While the sulfur shortage presents a serious immediate problem Mr. Williams added, it is fortunately not an insoluble problem. Plenty of additional sulfur can be produced, both in the United States or abroad, if we or perhaps the foreign users who are now drawing on low-cost American supplies are willing to pay for it. Sulfur from American brimstone deposits is currently selling in the domestic market at a figure of \$22 per long ton, less than a cent a pound. There are many other sources of sulfur, which is among the more plentiful of elements, pyrites, sour natural gas, petroleum refinery gas, smelter gas and gypsum. The hitch is that it is considerably more expensive to produce sulfur from these sources, and with our present anti-inflation, price-fixing program in the United States, the government is reluctant to afford the price relief which would encourage production from sources which are at present marginal or completely uneconomical.

It was brought out in a question period which followed Mr. Williams' general review of the sulfur supply picture that for most uses, except fertilizer, the price of sulfur is relatively unimportant. Many users, for example, would be more than glad to pay two, three, even five times the current price

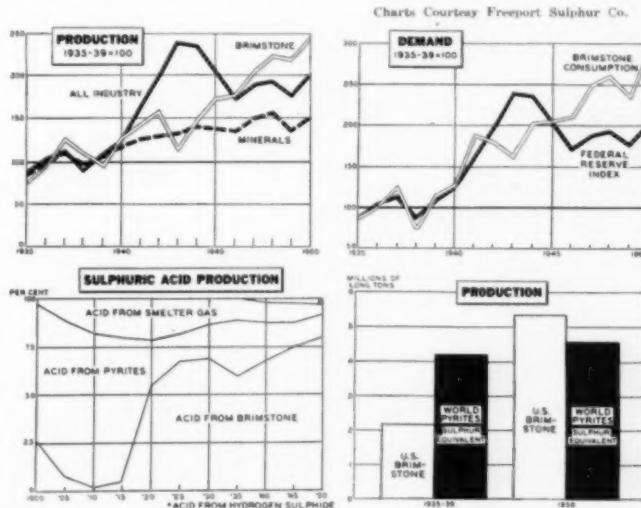
Current Export Rate Basic Cause of the Sulfur Shortage

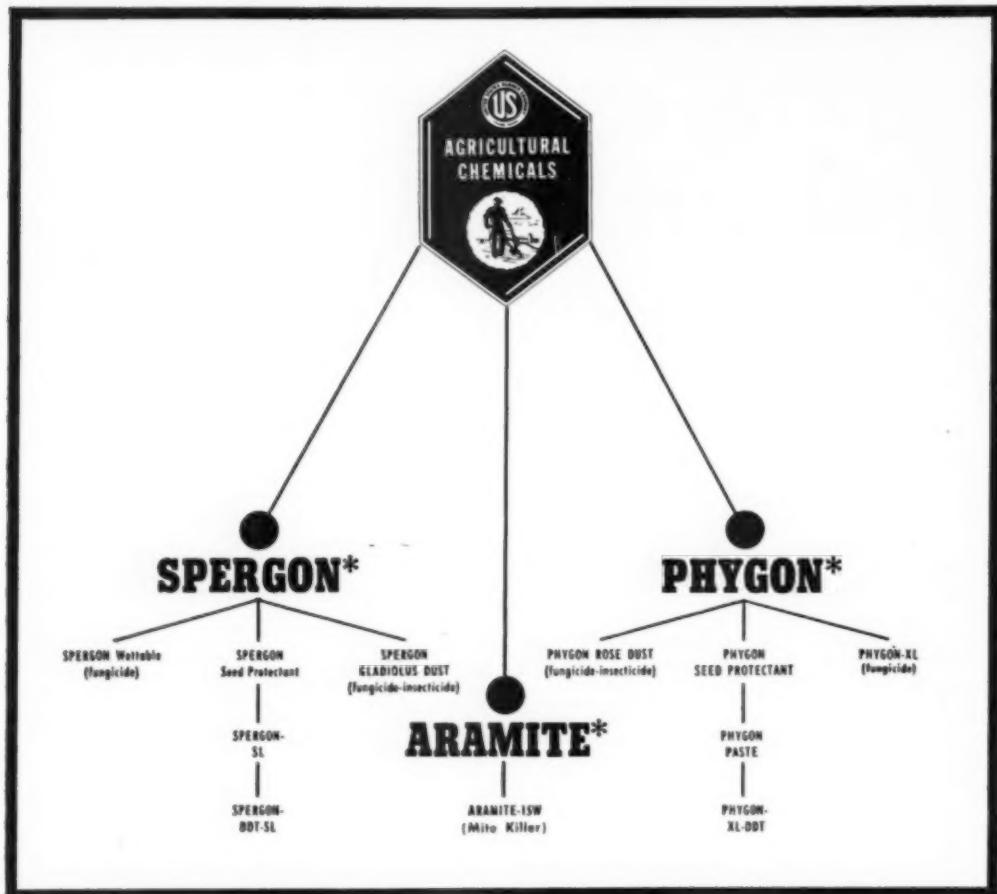
for sulfur if they could get adequate supplies, and in many cases the added cost of the sulfur would be unimportant in the price of the fin-

In a recent letter to its customers, Freeport pointed out that the 85% rate under its allocation program was based on the original Government directive for exports during the first quarter. Subsequently, the tonnage has been increased twice. If this trend continues, the company wrote, "we shall be obliged to reduce our present rate of allocation".

ished product. An important exception, of course, as indicated above, is sulfur for fertilizer use, where the low, cent-a-pound price is an extremely important factor.

A substantial share of exports of American sulphur are going to Great Britain—420,024 tons in 1950 out of the total of 1,441,000 tons exported. Since the war, Great Britain has been moving rapidly to build up its agricultural self sufficiency, and increases in fertilizer output have been high on the list of essential needs. Because of the high purity and low cost of American sulfur, the British turned in our direction for sulfur rather than to their historic supplier, Spain. Great Britain, incidentally, owns the two largest pyrites mines in the world, which are located in Spain. But even in the face of the growing shortage, and the inability of America to meet the expanding world





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With due modesty, but not without pride, do we of Naugatuck speak of the many benefits made possible by our agricultural chemical products.

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demand, they have moved with customary British deliberation to bring the Spanish pyrites deposits back into production.

While it is recognized by all connected with the sulfur supply picture that the United States faces economic and political obligations to tide our European and other allies over the worst of the supply crisis, it was also brought out rather strongly at the Williams press conference that additional pressure should be put on foreign users of American sulphur to put their traditional sulfur sources back into maximum production as promptly as possible, even if it involves their paying substantially higher prices. A number of questions linked our supplying of low priced sulfur to the British with their allowing the price of tin, rubber, etc., which they supply us, to advance sharply.

Sulfur has been on what has amounted to a program of voluntary allocation, by the producers, for about six months. Buyers have been getting 85% of their former purchases. On June 1, official governmental allocation was started. The National Production Authority has prohibited the delivery of sulfur by a supplier without specific NPA authorization, and has restricted the amount of sulfur which may be used by any person to a percentage of his use during a base year. (M-69 order). On July 1 another step in the allocation program was expected to go into effect, and over the second half of the year producers will be instructed where and how much to ship.

Incidentally the sulfur pinch is expected to grow much sharper in succeeding months. Last year we were able to get by only by cutting into our stocks to the extent of 350,000 tons, and it is considered extremely unwise to cut into them any further. This year, users have been drawing their pipe lines dry. From this point on, however, there seems to be little relief to be expected from any direction now apparent. In a normal economy, high price would stimulate production

from marginal producing sources, but with the present sulfur price controlled by OPS at \$22 a ton, only sources that can operate economically at this level can be brought into production. A number of new projects are under way in the United States. Mr. Williams explained, "An intensive effort is being made to boost our brimstone production. Three new mining plants are being constructed in Louisiana and Texas, but because of the unpredictable and

highly speculative nature of sulphur mining, the amount they will add to production cannot be determined until after they are in actual operation. In addition, 13 projects are under way to obtain sulphur from other sources.

"On the other hand, production from some of the older brimstone mines is bound to decline. Therefore, unless some rich new deposit of brimstone is discovered, the

(Turn to Page 103)

U. S. Production of Sulfur by Sources in Long Tons:

	1900	%	1935-39 AVG.	%	1950	%
Brimstone	3,000	4	2,175,000	84	5,350,000	90
Pyrites (contain sulfur)	82,000	96	222,000	9	391,000	6
Other sources	none	-	172,000	7	225,000	4
	85,000	100	2,569,000	100	5,966,000	100

**SULFUR CONSUMPTION - 1950
(by industry)**

Industry	Long Tons (2240 pounds)	Percent (approx.)
Fertilizers	1,665,000	34
Chemicals & Miscellaneous	1,200,000	24
Petroleum	472,000	10
Pulp & Paper	375,000	7
Rayon & Cellulose Film	365,000	7
Paints & Pigments	307,000	6
Iron & Steel	196,000	4
Insecticides & Fungicides	140,000	3
Other Metallurgical	110,000	2
Rubber	75,000	2
Industrial Explosives	41,000	1
	4,946,000	100%

Estimated World Supply of Sulfur from all Sources by Countries:

Country	1935-39 AVG. (long tons)	Percent	1950 (long tons)	Percent
United States	2,569,000 ^a	31	5,966,000 ^a	51
Japan	1,093,000	13	859,000	7
Italy	738,000	9	628,000	5
Spain	1,116,000	14	558,000	5
Norway	418,000	5	311,000	3
Portugal	195,000	2	295,000	3
Cyprus	173,000	2	289,000	3
Sub-Total	6,302,000	76	8,906,000	77
Other				
26 countries	1,898,000	24	2,794,000	23
TOTAL	8,200,000	100	11,700,000	100

Between the 1935-39 period and 1950:

U. S. Sulfur production (all sources) increased 134%

U. S. Brimstone production increased 146%

Foreign Sulfur production (all sources) increased 2%

^a in 1935-39, 85% represented brimstone; in 1950, 90% represented brimstone

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Washington Report

THE third meeting of the DDT Producers Industry Advisory Committee was scheduled to be held by the Chemicals Division of the National Production Authority on June 27th. Subjects to be discussed were the amount of Do's set aside for the third calendar quarter, a realistic program for the urgent overseas requirements, and the raw material picture.

A new government presiding officer, P. H. Groggins, who was recently appointed Chief of the Agricultural Chemicals Section of the Chemicals Division of NPA, presided for the first time.

* * *

The DDT producers can well be proud of the amount of material that they have produced since October 1, 1950. It is now estimated that during the 12 month period beginning October 1, 1950, that there will be a production of somewhere between 90 and 95 million pounds of technical DDT. This was produced in the face of severe shortages of chlorine, benzene, sulfuric acid, and a not too plentiful supply of alcohol.

DDT producers were called upon by the Chemicals Division of NPA during the past few months to make available rather large quantities of material to meet urgent government programs. A 300,000 lb. quantity of technical DDT had to be made available to the U.S.D.A. for the Oregon spruce budworm control, and all of this quantity was met without difficulty. Delivery had to be made during the latter part of April and May, which is one of the heaviest formulating seasons.

On the other hand, the industry also met without difficulty a requirement of approximately 200 tons, equivalent of 75% wettable DDT, needed for an urgent program for Iran. The malaria control program was sponsored by the Point Four program which is set up under

the jurisdiction of the Technical Cooperation Administration of the State Department. All urgency was the word to make this material available and the first 20 tons of the material required for this shipment to Iran was sent by air. The balance of the material was shipped by boat and the DDT producers and their customers came through to make each of the scheduled shipments as they were planned. The State Department attached a great deal of significance to the malaria program in Iran which is the hot-spot in the middle east at this time. The Point Four requirement for DDT is not to be mistaken with the normal amounts of DDT handled for Iran through regular industrial channels. The industry feels that the Point Four program will do much to increase the need and the popularity of DDT for control of malaria in this area.

* * *

Sulfur was placed under allocation by the NPA on June 1st. The order M-69 requires sulfur suppliers to ship the material only when authorized by NPA. Sulfur users are limited to 100% of the 1950 rate of consumption. The use restriction became effective immediately, that is on June 1st, while the authorization to suppliers was scheduled to begin July 1st. Buyers and consumers of sulfur are required to make monthly reports to NPA on their uses of sulfur and the amounts they maintain in their inventories. NPA outlined the procedure as follows:

Before the first of the month preceding calendar quarter in which shipments are to be made, a supplier will file with NPA a form NPA-99 listing his proposed shipments for the quarter. NPA will examine the application, making whatever adjustments are required, and will return the form to the supplier at least 10 days before the quarter begins. He is then authorized to make the shipment.

On the other hand, the user of sulfur will make monthly reports on or before the 28th day of each month. The user is required to report on form NPAF-99 his use of sulfur during the preceding month and his inventory at the close of that month. He is also required to estimate his use during the current month and estimate what his

inventory will be at the end of the month.

NPA hopes in this way to get a complete report on usage and thus will be able to get an accurate detailed picture of the products requiring the use of sulfur and the amounts consumed for each. There is a small order exemption for both suppliers and consumers. Special provisions also will be made for special adjustments when reasonable requirements make the 100% monthly use restriction impracticable.

It is estimated that the rate of consumption of sulfur has increased so rapidly in recent years that the 1951 demand will exceed the sulfur supply by over a million tons. The total 1951 production is estimated at about 5,200,000 tons.

Production of sulfur during 1950 reached a peak of 5,192,104 long tons, an increase of 148% over 1939, and an increase of 38% over the peak years of World War II.

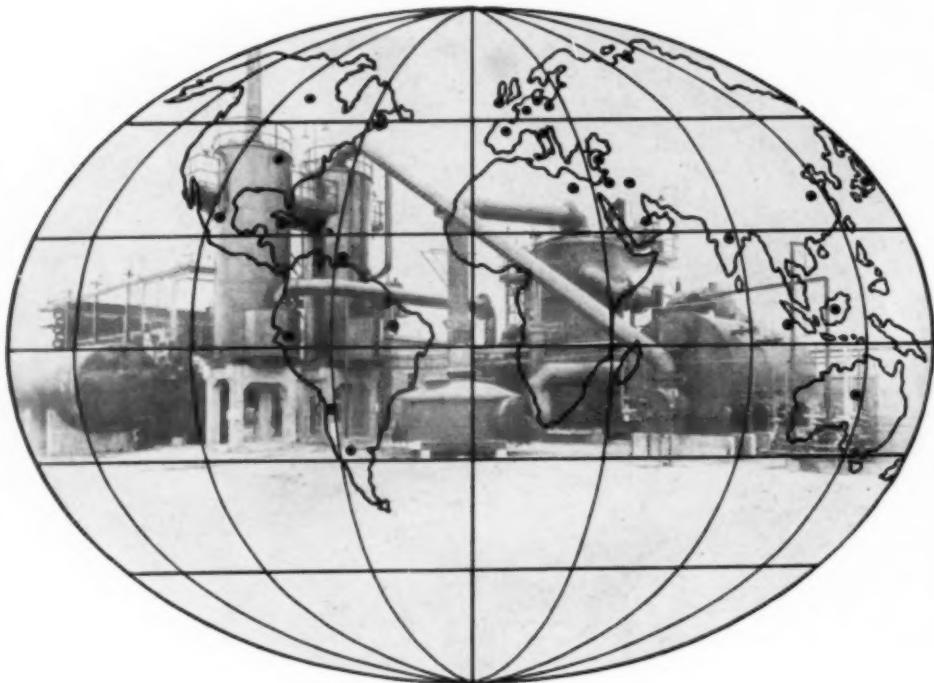
It is felt by most industry spokesmen that the Chemical Division of NPA will make a determined drive to conserve sulfur as much as possible during the coming two to three years, and that one of the best places to bring about this conservation would be in the agricultural pesticide field. Great efforts are expected to be made in connection with the recommendations for cotton insect control for the 1951-52 season, to recommend sulfur only where it is absolutely necessary to be used.

* * *

An announcement made by NPA in the early part of June will affect the production of passenger cars for the third quarter of 1951. Many industries had previously complained about the tremendously increased production of passenger cars while there were many very stringent restrictions made on other industries.

NPA accomplished this reduction by the issuance of their order M-68 which limits the use of steel, copper and aluminum in automobile manufacture without a direct control on unit production. NPA pointed out that the use of limitations will have the effect of an estimated 37% reduction of third quarter 1950 output.

Howard J. Grady, vice-president of California Spray Chemical Corporation, was recently appointed to head a section in the Rubber, Chemicals & Drug Division, Office of Price Stabilization, of ESA. The appointment became effective June



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CUBA	FRANCE	SUMATRA
TRINIDAD	SPAIN	BORNEO
CURACAO, N.W.I.	ITALY	AUSTRALIA
ARGENTINA	TURKEY	CHINA
BRAZIL	EGYPT	JAPAN
CHILE		



11th. Mr. Grady is to be concerned with the pricing of agricultural insecticides, etc. Mr. Grady will operate under the Division which is headed by Thomas H. McCormick of du Pont. Cedric Gran remains as a consultant to this group but will be concerned primarily with fertilizers while Mr. Grady will confine his activities to pesticides.

* * *

Louis N. Markwood had been made Director of the Office of International Trade's Chemical Division, having recently transferred from the Chemicals Div. of NPA. Mr. Markwood will be in charge of chemicals, but it is surprising that insecticides are not the concern of the Chemicals Division, but instead, will be handled by the Food branch of OIT.

It appears to many observers that Chemicals should handle insecticides, both the finished materials and the chemicals from which they are made. Previously, this was not the case in OPS. Recently, insecticides were put under Chemicals in the pricing organization also. It is hoped by many in the trade that the export of insecticides will soon be placed where they seem to belong.

* * *

The OPS has issued supplementary regulation No. 7 to CPR-22 which gave the chemical industry a better break pricewise than the original CPR-22. The regulation, effective June 27th, did three things:

- 1) It permits chemical manufacturers to use long term sulfur contract prices in computations instead of following methods set forth in the original regulation.
- 2) It provides an alternate to the methods prescribed in computing ceiling prices for chemical by-products.
- 3) It also made an exception in the chemical industry in allowing it to add increased repair and maintenance material costs to base period prices because of the highly corrosive action numerous chemicals have on construction materials.

The OPS also announced to be effective late in June, a rollback in the price of copper scrap amounting to more than 35%. The rollback is one of the sharpest ever ordered by OPS and is expected to relieve substantially the current shortage of copper sulfate. With the price of scrap copper inflated, it was not possible for those copper sulfate manufacturers

who depended on scrap to get sufficient raw material at a price favorable enough to make copper sulfate and still sell at their ceilings. Thus the price rollback on scrap should materially relieve the supply situation. ★★

Heads Fruit Fly Research

The United States Department of Agriculture recently an-

nounced that investigations on control of the Oriental fruit fly in the Hawaiian Islands will be headed by Leroy D. Christensen. Mr. Christensen will succeed Dr. Walter Carter, who organized and directed the investigations as an emergency measure in 1949.

USDA Launches Sulfur-Saving Project

THE United States Department of Agriculture has launched an active campaign to stretch the sulfur supply as far as possible through strict conservation of its use. A three-point program is in action, according to W. R. Allstetter, deputy director of the Office of Materials and Facilities, Production and Marketing Administration, U.S.D.A., who heads the six-man committee working on the problem.

Three points of attack include the elimination, so far as possible, unnecessary or "useless" use of sulfur as diluents and in dusts where it may not be absolutely essential; an attempt to adjust where feasible the ratio of fertilizer mixtures from the usual 1-2-1 and 1-3-1 ratio, to a possible 1-1-1 ratio, thus conserving phosphate. The third point hinges on the substitution of alternate materials in insecticides and fungicides to relieve the pressure on sulfur supplies.

In discussing the situation, Mr. Allstetter stated that the U.S.D.A. decided in May, that no matter how favorable the sulfur supply situation may become, it was evident that the agricultural demand could not possibly be met. While sulfur supplies dwindled, demand for elemental sulfur for pesticides increased 23% in 1951. Through efforts by the NPA and by transferring supplies from soil sulfur, 12% of this demand was met, leaving a net deficit of some 11%. Phosphate demand in 1951 is up 11%, with no increase in supply.

A considerable increase in Nitrogen production is anticipated for the next three years, according to NPA. By 1953, additional capacity for nitrogen production is expected

to be from 600,000 to 700,000 tons; while in 1952 the government plant at Morgantown, W. Va. may be in production. Its annual capacity is about 200,000 tons of nitrogen. The Mississippi Chemical Co. plant at Yazoo City, Miss. has begun operations to help bolster the supply.

But so far as sulfur and phosphate are concerned, the outlook for 1952 is bad, Mr. Allstetter said. Beyond that, the supply situation for 1953 and later will depend largely upon how successful will be current proposals in the treatment of phosphate rock with nitric acid for the manufacture of phosphate fertilizers.

A committee under the chairmanship of Dr. Frank Parker, Bureau of Plant Industry, Soils and Agricultural Engineering, U.S.D.A., is making a detailed study of fertilizer ratios to determine the most favorable combinations of NPK. Members of the Committee, in addition to the chairman, are: Drs. K. C. Berger, Madison, Wisconsin; W. E. Colwell, N. Carolina; J. P. Conrad, California and Mack Drake, Massachusetts. Findings of the committee will be regarded as a guide to be followed in the future.

The emphasis on reducing phosphate and increasing other ratios, in the words of a Department representative, "is in the direction we were going anyway." The eventual goal is to find ways to increase crop yields with less sulfur and its derivatives. Finding the correct answer is a very complicated matter, Mr. Allstetter observed.

No regulations for the agricultural use of sulfur are anticipated at the present time, except the pos-

(Turn to Page 93)

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Del-Mar-Va Fertilizer Group Meets at Ocean City

MORE than a hundred persons attended the 30th annual convention of the Del-Mar-Va Peninsula Fertilizer Association held June 30 at the George Washington Hotel, Ocean City, Md. Delaware's Governor Elbert N. Carvel, president of the association, presided. Talks were heard from representatives of the National Fertilizer Association, the American Plant Food Council, Dr. Borden S. Chronister, the Barrett Division, Allied Chemical & Dye Corp., and by the Hon. Herbert R. O'Conor, U. S. Senator and former Governor of Maryland.

In Dr. Chronister's talk, "Nitrogen in Modern Agriculture", he termed the element "the senior partner in the plant food bank", and likened the soil to a bank in which one must keep his accounts in balance by depositing at least as much as is removed. He warned against "robbing the bank" by withdrawing much and replacing little.

"The fertilizer industry holds the key to a better standard of living", he said. "Fertilizer is still the farmer's best buy". He presented charts showing that withdrawals are equal to, if not greater, than deposits of plant food, and urged the use of more nitrogen. "We don't have legumes and manures like we did in times past, and this deficiency must be made up," he declared. "Commercial fertilizers and manures work together and complement each other," the agonomist declared, but emphasized that manures, when used alone, soon reach a stalemate. "You can get just so much out of manure . . . no more", he concluded.

Fred S. Lodge, secretary-treasurer of the National Fertilizer Association, Washington, D. C., told the group that supplies of fertilizer raw materials are bound to be tight during the coming year, particularly in superphosphate, but declared that nitrogen supplies are likely to be increased.

Louis H. Wilson, secretary and director of information of the American Plant Food Council, Washington,

D. C., discussed the supply situation further, quoting Secretary Brannan that while the government is eager to help in supplying plant food, private industry is expected to carry the heavy responsibility of production.

Senator O'Conor's appearance on the program came as a surprise. He reminded the group that it is the business people of America who recognize most acutely the dangers of inflation and reiterated that the Kremlin is waiting for and expecting a collapse of the American system. Inflation, he said, is the most positive way to bring this about.

Governor Carvel introduced a number of visitors, including agonomists, control officials from the three states represented, industry people, and the trade press. The afternoon program was devoted to recreation for conventioneers and their wives. In charge of entertainment for men was W. H. Smith, D. D. Culver and J. Otis McAllister. The ladies committee comprised Mrs. T. Scott Purse, Mrs. W. B. Tilghman, Jr. and Mrs. Warner W. Price. Governor Carvel was chairman of the program committee, composed of Ralph A. Ross and John L. Morris. Registration was handled by Robert A. Fischer and James Sturgis, while Ben T. Truitt and T. Scott Purse took care of hotel arrangements.

Error Pointed Out

That Drs. Paul A. Neal and Wayland J. Hayes, Jr. are connected with the U. S. Public Health Service instead of the U.S.D.A., as mentioned in our May issue, is pointed out by S. W. Simmons, Scientist Director Chief, Technical Development Services of the U. S. Public Health Service, Savannah, Ga. Mr. Simmons comments on the coverage given by Agricultural Chemicals of the Delaney Committee Hearings, and continues by stating that:

"Dr. Neal and Dr. Hayes are officers in the Regular Corps of the U. S. Public Health Service and presented testimony before the Delaney Committee as official representatives of that Service.

They were scheduled on a day when various representatives of the Department of Agriculture were supposed to appear and this may well have led to the misunderstanding.

"Since the toxicity of insecticides to man represents the crux of the entire problem in our toxicological studies and since the Public Health Service is the principal Federal agency with facilities for direct clinical research on man, we feel that a recognition of the Service in the insecticide field is of considerable importance. We make this statement because we feel that a continuing study of the effect of economic poisons on man is necessary.

"Our toxicologists are in constant contact with those in the Department of Agriculture, who are concerned chiefly with the study of domestic animals; with those in the Food and Drug Administration, who are concerned with the study of laboratory animals; and with other toxicologists in the country associated with universities and private research laboratories. All of these groups of workers in this country as well as groups in other countries have contributed to our present knowledge of the toxicology of economic poisons. There has been work on the toxicity of some of these poisons to man sponsored by universities or various private laboratories, as well as by the Public Health Service. You will be interested to know that through an arrangement with the Division of Hospitals of the Public Health Service, we are able to make complete studies of persons extensively exposed to economic poisons whether the exposure has resulted in actual illness or not. Hospitals in which these studies may be made, with recommendations of this office, are located in Boston, New York, Baltimore, Norfolk, Savannah, Galveston, San Francisco, Seattle, and Chicago.

Urge Corn Pest Control

Effective use of materials available for control of the corn borer was stressed by Charles F. Brannan, secretary of agriculture, in a recent bulletin by the department. Mr. Brannan stated that "This year it is doubly important that effective control measures be taken, not only because of the urgent need for better than average yields, but also because of the limited supplies of DDT". It was pointed out that stocks of DDT and ryania in the corn areas should prove adequate, unless corn borer infestation exceeds expectations. Detailed recommendations as to rates and methods of application, when to apply, and availability of materials and equipment can be obtained from local agricultural agents.

New Agricultural Yearbook

Publication of the 1950-51 Yearbook of Agriculture, a 968-page volume entitled "Crops in Peace and War" was announced recently by the U. S. Dept. of Agriculture. The book deals with the processing of all major American farm products, their industrial and food uses, byproducts, utilization of wastes and secondary materials, procedures involved in finding new uses, and requirements of consumers and markets. The book is intended primarily to inform farmers about the handling of their products; and is largely a report of the work of the Department's four regional research laboratories. Copies are available at \$2.50 each from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. It is requested that orders not be sent to the Agricultural Department or any of its bureaus.

IMC Promotes Koechlin

F. A. Koechlein has been appointed general manager of the Phosphate Division of International Minerals & Chemical Corp. Chicago, according to a recent announcement by F. Farley vice-president of the division. Mr. Koechlein has been with International since 1929, and for the past six years has been assistant to the vice-president in charge of the Phosphate Division.

Fruit Growers Meet

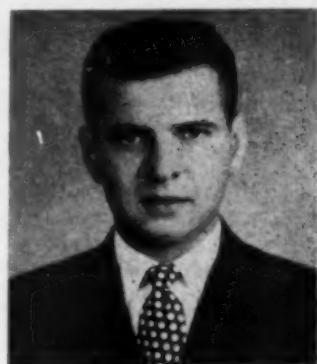
The New Jersey State Horticultural Society held its annual summer meeting in Monmouth County on July 7th. After a tour of Colts Neck Orchards and packing house, and the Sydney McLean Orchards, the group heard reports on the 1951 peach and apple crop prospects.

Fertilizer Group to Meet

The Fertilizer Sub-Section, Chemical Section of the National Safety Congress will feature a symposium on Safety in handling fertilizers at the annual meeting of the National Safety Congress in Chicago, on October 11th. The following reports will be presented at the symposium, which will be directed by

J. M. Sisson, TVA, Wilson Dam, Alabama: "Handling of Sulfuric Acid" by David P. Delavan, Matheson Chemical Corp., Pasadena, Texas; "Handling Anhydrous Ammonia and Ammonia Solutions" by H. R. Krueger, Phillips Chemical Co., Bartlesville, Oklahoma; "Handling Bulk Storage" by U.C. Ellis, Swift & Co., Chicago; "Operation of Mobile Equipment" by C. E. Killebrew, Frank G. Hough Co., Libertyville, Ill.; and "The Importance of Good Housekeeping in Lowering Costs" by M. F. Wharton, Arizona Fertilizers, Inc., Phoenix, Arizona. The group also has scheduled tentatively a film on fertilizer safety.

upon by the technical committees, and (2) continue to publish and make available to NFA and its members, as



EDWIN C. KAPUSTA

N. Y. Meeting In November

The 13th annual New York State Insecticide and Fungicide Conference and the 3rd Annual Pesticide Application Equipment Conference will be held at Bibbins Hall, Ithaca, N. Y., November 7-9, according to announcement by Dr. Charles E. Palm, Head of the Department of Entomology, Cornell, Univ.

NFA TVA to Cooperate

TVA and The National Fertilizer Association have signed a memorandum of understanding providing for increased exchange of information in the fields of fertilizer research, production, distribution and use. The new agreement follows several years of informal cooperation in these fields.

The understanding provides that each party will (1) appoint a committee to consult on broad policies of mutual interest, and (2) appoint a technical committee to meet regularly to exchange information, review fertilizer research and development programs, and discuss and recommend problems for study, each party to designate a staff member to serve as a liaison agent.

TVA will (1) use its fertilizer and munitions research facilities to the extent feasible for the purpose of conducting research and experimentation on problems relating to fertilizer processing and manufacture as agreed

well as to others, the results of research in these fields in accordance with TVA's established policy.

The Secretary of Agriculture and the Secretary of the Interior will each be invited to designate a representative to be kept informed as to meetings and, when appropriate, to participate.

To implement its part in the program and to establish liaison between NFA and TVA, NFA has engaged Edwin C. Kapusta to serve as secretary of its technical committee, effective July 2. Dr. Kapusta, who served in the Naval Reserve during 1945-1946, is a graduate of Rensselaer Polytechnic Institute, Troy, N. Y., and was awarded his Master's degree in 1947 from Worcester Polytechnic Institute, Worcester, Mass. in 1947, and his Ph.D. in Chemical Engineering from Iowa State College at Ames this June. His thesis subject: "Quick Curing of Superphosphate." From July 1947 to September 1948 Dr. Kapusta was on the laboratory staff of the American Cyanamid Company at Stamford Conn.

Eastern A.A.E.E. to Meet

Officers of the Eastern Branch of the American Association of Economic Entomologists have announced that the group will meet at the New Yorker Hotel, New York City, November 15 and 16.

The Listening Post

Fungicides for Control of Mildew

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of **AGRICULTURAL CHEMICALS**. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Survey Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, Beltsville, Md.

By Paul R. Miller



REPORTS received and distributed through the Warning Service of the Plant Disease Survey have shown again that efficient and adequate use of fungicides, even in a comparatively light disease year, is more than worth the farmer's time and money. Effective protection has been obtained in many cases in spraying and dusting for control of late blight of potato and tomato and blue mold of tobacco.

This year late blight has been somewhat variable in its attack. Fig. 1 shows the distribution of blight on tomato to May 22nd. In the Bradenton-Ruskin area of Florida it was reported early in January in winter plantings and at the end of March had developed in numerous plantings in the vicinity of Bradenton. In the Bradenton-Ruskin green-wrap acreage, blight was found scattered throughout the area in varying amounts. Fields which had been properly sprayed showed only a trace of blight, with this almost perfect control achieved under ideal weather conditions for blight development. Showers had occurred in this area from April 6 to 27th.

In the southern part of Florida blight was general in the Immokalee area in early February and in one instance destroyed 100 acres of tomatoes by mid-February. Some growers had effected control with carbamates but also experienced spray injury. By early April some fall plantings were abandoned and blight had become serious on the youngest spring plants.

In the Ft. Pierce-Vero Beach-Indiantown, and also Sanford, areas very little blight was observed and was considered not serious. Up to the time of this report no blight had been observed in Lake, Sumter, or Marion Counties, none had been found at Hastings, nor in the tomato plant shipping areas of Florida.

Despite the enforcement of

State inspection of Florida-grown plants, blight was observed in the Palmetto-Cotton, Georgia, green-wrap tomato area on April 25 on transplants from Indiantown, Plant City, and Bartow areas. Stem canker was the most noticeable stage of the disease. In the Claxton-Reidsville-Glenville area late blight was observed in trace amounts. No late blight, however, was observed in the Tifton and Claxton plant-growing areas.

Blight also appeared this year in cold frames in Louisiana and Mississippi and in a greenhouse near Rochester, New York.

Blue Mold. Blue mold of tobacco during this early part of the season, as shown in Fig. 2, occurred in Atlantic Coast States as far north as Massachusetts and as far west as Tennessee. Owing to the lightness of attack this year, blue mold caused a minimum of damage and loss of transplants. Along with the light at-

Table 1
Effect of fungicides on incidence of scab^a

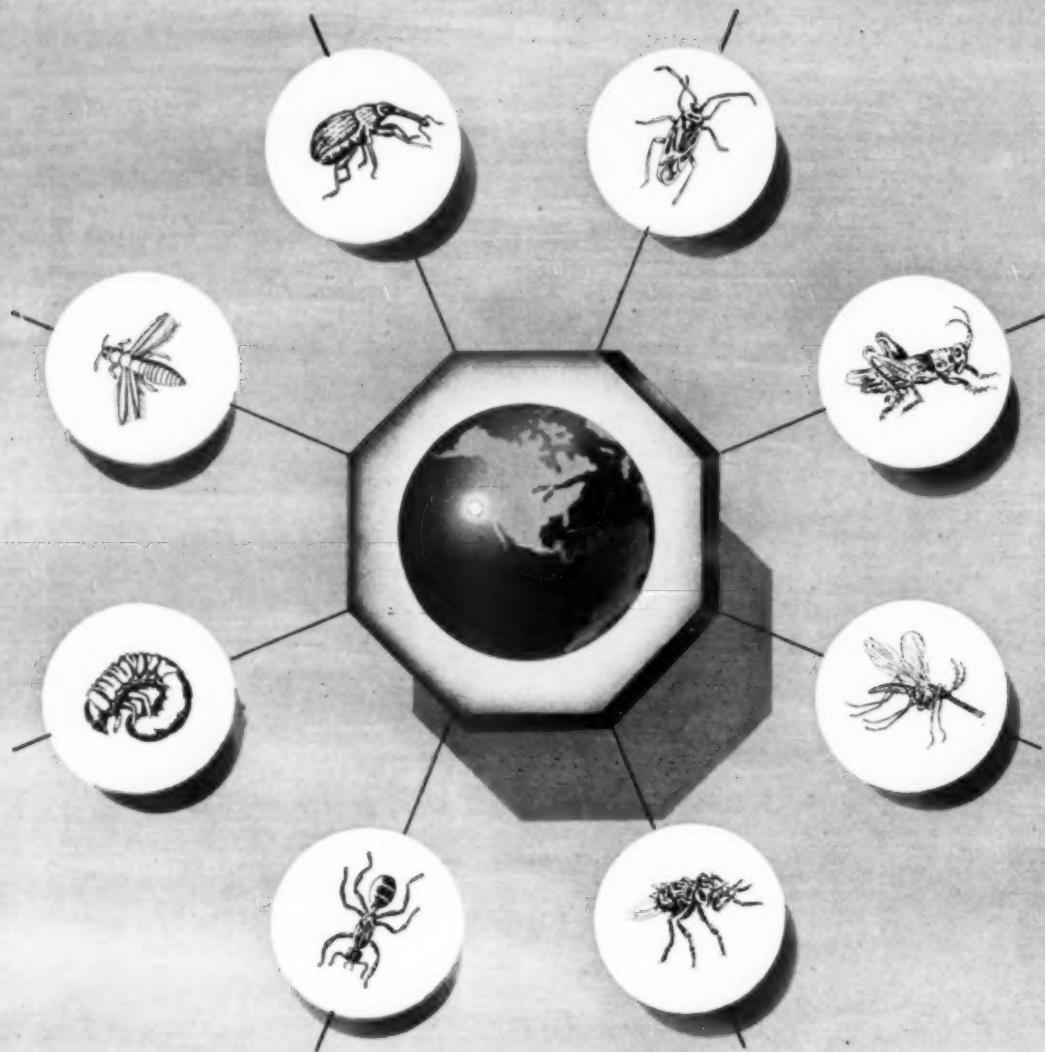
Treatment	Number of trees sprayed	Number of shucks examined	Percent infection per class ^b			
			1	2	3	4
None	16	164	0.00	0.00	0.60	6.00
Bordeaux mixture	16	1777	0.23	1.20	39.30	24.67
Bordeaux-Zerlate	16	1642	0.12	2.18	41.10	38.60
Zerlate	16	1531	0.75	0.95	27.95	30.75
Orthocide 406	16	1686	0.35	6.50	41.95	30.30
						20.90

^aScab data are based on shucks of pecans which could be readily observed from base of tree.

Class
1—no infection on shuck
2—1/3 initial infections on shuck
3—4 or more initial infections on shuck
4—few secondary infections on shuck
5—numerous secondary infections on shuck

Table 2
Number of pecans per pound as affected by treatments

Fungicide treatment	Number of trees sampled	Number of Pecans weighed	Average Number of pecans per pound
None	11	1125	112.50
Bordeaux mixture	8	1053	87.75
Bordeaux-Zerlate	8	1698	87.25
Zerlate	9	1266	105.50
Orthocide 406	10	1053	87.75



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tack of the disease, the outstanding factors contributing to the freedom of plants from blue mold and to successful plant production have been the careful adherence to control measures and the proper application of fungicides in spraying and dusting programs. Also, farmers have shown an interest in chemical weed control and in the adequate irrigation of plants in the plant-bed stage. More than 95 percent of the beds checked in one survey in South Carolina had been treated, mostly with dust, and the foliage was well-covered. South Carolina growers, as a whole, apparently have accepted blue mold treatment as a part of regular plant-bed care and many started blue mold treatment before the appearance of the disease.

A fourth decisive factor in this successful plant year was the severe winter which completely destroyed early-sown beds in the more southerly areas. These beds normally develop blue mold early and give the disease a long period over which to build up and spread.

The latest seasonal outbreak since the disease first appeared in 1931 occurred in the flue-cured tobacco area of Georgia between April 7 and 14th. Not more than five percent of the Georgia plants were estimated to have been killed by the disease in 1951.

Blue mold was also well-distributed in the eastern and middle Belts of North Carolina by the middle of April. In South Carolina dry, cool weather in January and February prevented good stands and some reseeding had to be done.

By the middle of May mold was generally present throughout the flue-cured tobacco area of Virginia. However, as flue-cured growers have learned the necessity of applying blue mold control measures each year, almost all beds were treated with ferbam, with the result that plenty of plants were available.

Of interest this year has been the appearance of wildfire in untreated beds and in areas where it had not been serious in recent years. Where growers used Bordeaux mix-

ture according to recommendations, very good control was secured. In east Tennessee there occurred the most general and severe outbreak of

wildfire that has occurred in this area during the past twenty years. Eighty percent of all beds in the area were affected, with infection ranging from



Fig. 1. Distribution of Tomato Late Blight
January 19 - May 22, 1951.

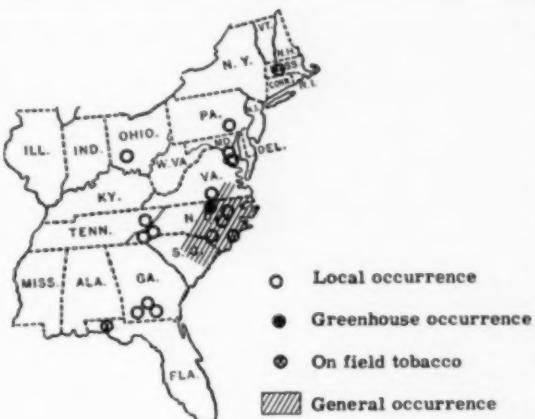


Fig. 2. Distribution of Blue Mold of Tobacco
January 19 - May 22, 1951.

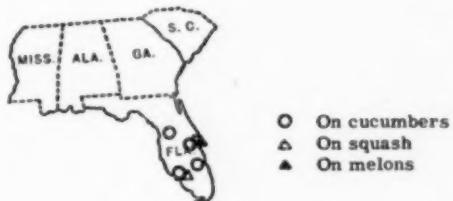


Fig. 3. Distribution of Cucurbit Downy Mildew
January 19 - May 22, 1951.

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slight to complete destruction of all plants. A few growers, using copper treatments, obtained good control; in other cases lack of adequate control could be attributed to improper treatment. Observations indicate that

spread of wildfire is associated with (a) weeding; (b) flea beetle injury; and (c) water washing through beds.

Also, owing to the unusually wet, cold weather of late February and early March, damping off, cause

not definitely known, destroyed many plants, resulting in poor stands and, in some instances, abandoned beds in the Burley tobacco area of east Tennessee.

(Turn to Page 97)

Weevils, Corn Borer Reported Abundant

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Dr. Haeussler is in charge of Insect Pest Survey and Information, Agric. Research Adm., B. E. & P. Q., U.S.D.A. His observations are based on latest reports from collaborators in the department's country-wide pest surveys.

By G. J. Haeussler



MOST of the cotton-growing States and the Federal Bureau of Entomology and Plant Quarantine are issuing frequent reports or releases again this year giving information on the status of various insect pests of cotton and their control. The reports issued thus far indicate that boll weevils probably survived the winter in all counties where they were abundant in 1950. Examinations of surface trash this spring showed the presence of living weevils in Virginia, North Carolina, South Carolina, in the Tennessee Valley of northern Alabama, in northern Louisiana, and in eastern and northern Arkansas.

By the middle of May, weevils had been found on seedling cotton as far north as Fannin County in northern Texas, and in Smith, Anderson, and Henderson Counties in northeastern Texas. A report on May 22 indicated that weevils had been found in considerable numbers in certain fields of Wharton and Fort Bend Counties in the upper Coastal area of Texas, and by the end of May a few had been found in McLennan and Falls Counties. Only about 1/3 to 1/6 as many weevils were found in the cotton fields of Madison Parish, Louisiana during each of the last 3 weeks of May as were found during the corresponding period in 1950. By early June, boll weevils were starting to appear in cotton fields in the hill sections of Mississippi,

but in much smaller numbers than at the same time a year ago. During the week ending June 8, they were found in small numbers in a few fields in the Delta area. During the latter part of May, the weevil population in Alabama was reported to be lower than it has been at that time of the season for a number of years. Some weevils were reported in the cotton fields of Arkansas by June 4, but in very small numbers. Weevils were first reported from Oklahoma early in June. In South Carolina weevils were found in small numbers during the latter part of May as compared to the numbers found during the same period last year. Weevils were showing up in the cotton fields of North Carolina toward the end of May, but activity was apparently delayed as a result of dry, cool weather.

As of the first of June, infestation records indicated that the pink bollworm was about twice as abundant this spring in Hidalgo and Starr Counties of Texas as that insect was a year ago. The pink bollworm situation was also reported as serious in the following 14 other counties of southern Texas: Atascosa, Bee, Duval, Brooks, Dimmit, Jim Wells, Kleberg, Live Oak, Maverick, Nueces, San Patricio, Webb, Zapata, and Zavala.

Thrips damage to cotton was reported during the latter part of May as rather serious in some counties of northeast Texas. They were caus-

ing some damage in other parts of Texas, eastern and southeastern Oklahoma, Louisiana, the Piedmont and Pee Dee areas of South Carolina, and to a few fields in the Charlotte area of North Carolina. Thrips were apparently not abundant or widespread during May on cotton in Arkansas, Mississippi, North Carolina and South Carolina.

No serious aphid infestations on cotton had been reported by early June.

Bollworms were reported damaging cotton leaves and young squares in several counties of southwestern South Carolina the last week of May. Control measures were required in some instances. Some bollworm larvae were collected on cotton in Issaquena County, Mississippi on May 30. Bollworms made their appearance on cotton 2 or 3 weeks earlier than usual in the Tallulah area of Louisiana. They were reported as plentiful in several other parts of that State.

European Corn Borer

REPORTS from Illinois indicated that from surveys made last fall, the European corn borer population that went into hibernation was only about 1/5 to 1/4 as large as the number of borers that went into hibernation there in the fall of 1949. Borer mortality during the winter just passed was somewhat greater than normal. Therefore, generally speaking, the corn borer situation in the State was not considered threatening this spring, although an upward trend in the borer population might develop later in the season. By early June, emergence of the moths was well under way in southern, south central, and north central Illinois and a few egg masses were being found in the southern areas.

(Turn to Page 92)



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Technical Briefs

BHC Controls Spittlebug

Benzene hexachloride applied to give 0.2 pound gamma isomer per acre in 37 and 100 gallons of spray mixture gave excellent control of spittlebug nymphs even when applied to foliage as much as 12 inches high. The same insecticide contained in 9 gallons of spray mixture was less effective on tall plants. Yields of a mixed meadow crop were increased 22 to 48 per cent by treatment.

Benzene hexachloride applied at 0.2 pound gamma isomer per acre when the first spittle nymphs appeared (April 27) gave sufficient residual action to control 98 per cent of the nymphs including those which hatched after treatment.

Benzene hexachloride, 0.2 pound gamma isomer, and toxaphene 1.5 pounds per acre applied in either high or low volume when the plants were less than 8 inches high gave excellent control of spittlebug nymphs. Chlordane and aldrin at 1.0 pound and .25 pound per acre, respectively, gave less control but reduced the insect numbers to the extent that the yield was not seriously affected by those that survived the treatments.

Rain immediately following applications of benzene hexachloride, toxaphene, and chlordane apparently did not reduce the efficacy of the materials in controlling spittlebug nymphs.

—"Meadow Spittlebug Control with low and High Volume Insecticide Applications," by C. R. Weaver, Ohio Agricultural Experiment Station, Wooster, in *Journal of Economic Entomology*, Vol. 44, No. 2, April, 1951.

Rotenone for Pea Weevils

Progress Report 7741, issued by the New York State Agricultural Experiment Station, Geneva, announced that rotenone is rated the number one treatment for weevils in pea fields. Application of one per cent dust containing two to three per cent lubricating oil and a stand-

ard diluent is made when about one-fourth of the pea vines are in bloom. Three applications may be necessary, depending on the infestation. Forty pounds of dust to the acre are required when ground dusting is used, and fifty pounds to the acre when airplane dusting is used.

AMA Discusses DDT

Although DDT is an "essentially poisonous material," it can be used with a wide margin of safety if wisely used according to a report in a recent issue of the *Journal of the American Medical Association*. The report by the committee on pesticides of the AMA's Council on Pharmacy and Chemistry is summarized as follows:

The committee, which recently reviewed literature and case reports on the substance, points out that the poisonous effect of DDT on living organisms decreases with the increase in complexity of the organism. Thus insects, a lower type of organism, are destroyed by the substance while human beings and the higher types of animals are "not likely" to be harmed.

Some human deaths, however, have been caused by DDT and therefore "certain precautions must be observed to guard against its potential toxic properties," they added.

A warning was given to farmers to be careful when applying DDT to food or fodder crops. DDT applied directly to the edible portions of a plant may result in poisoning. It should not be used on dairy cattle or animals being prepared for slaughter, the committee pointed out, since there is a danger of accumulation of the substance in the milk and tissues of treated animals.

Other precautions suggested by the committee are as follows:

"DDT insecticides should never be stored in food cupboards or medicine chests where there is a like-

lihood of contamination of food or mistaken use. All exposed foods, utensils and working areas must be covered when kitchen and dining areas are being sprayed. Children's toys or cribs and rooms occupied by sick people should not be sprayed. Use of oil solutions on household pets should be avoided and, DDT powders should be used only where they cannot be licked off. Intimate skin contact with aerosol discharge is to be avoided. Plants and aquariums in the home should be removed or covered before applying DDT sprays or aerosols. The use of oil solutions in the vicinity of open fires should be avoided because of the inflammability of such mixtures . . .

"Persons exposed to large amounts of DDT dusts and powders under confined conditions or where dust particles are not carried away by free movement of air currents should wear respirators. [Chronic poisoning from DDT may result from prolonged ingestion or exposure to small amounts.] Such conditions might be encountered in mass delousing procedures, larvicide with dusts, and manufacturing or formulating operations. Protective clothing should be worn when there is a possibility of greases and oils contaminating the skin, thereby enhancing the absorption of DDT dusts or powders . . .

"Frequent or prolonged exposure to emulsions or solutions of DDT in petroleum oils and organic solvents should be avoided unless protective clothing, goggles and neoprene or solvent-resistant gloves are worn. [Oily solutions may be absorbed through the skin.] Clothing must be changed promptly if concentrates are spilled on them. A contaminated skin area which has come in contact with DDT soaked clothing or spilled DDT concentrates should be washed immediately with soap and water. Concentrates should be mixed in well ventilated rooms and fire precautions observed when volatile and inflammable solvents are present . . .

"Operators involved in large scale spraying or fogging with solutions of 5 per cent or more of DDT should wear respirators and other protective

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devices. Smoking is to be avoided during spraying when combustible mixtures are used. Greaseless skin lotions should be used on exposed body surfaces when irritant solvents are present in the formulation. Clothes should be changed and the body cleansed after each day's operation."

Fly Journeys Studied

A study of the flight habits of three species of flies is reported in the June, 1951, issue of the *Journal of Economic Entomology* (Vol. 44, No. 3), presenting some interesting data on the subject. The article, written by Arthur W. Lindquist, W. W. Yates and Robert A. Hoffman of the U.S.D.A. and Joseph S. Butts, Oregon State College, is summarized as follows:

Three specimens of flies were tagged by feeding them solutions of radioactive phosphoric acid (containing P^{32}) and then released in an agricultural area south of Corvallis, Oreg. A total of approximately 36,000 *Musca domestica* (L.), 15,000 *Phaenicia sericata* (Meig.), and 1,200 *Phormia regina* (Meig.) flies were released, of which 4.6, 3.62, and 14 per cent of the respective species were recovered. A total of 24 fly traps encircled the release point at 0.5, 1, 2, 3, 4 miles the first day, after which the traps in the inner circle were moved farther out. *M. domestica* was recovered 12 miles, *P. sericata* 4 miles, and *P. regina* 8 miles from the center. Most of the tagged flies were caught the first day in the traps 0.5 mile from the release point. Tagged flies had moved outward 4 miles in each cardinal direction the first 24 hours after release.

The ratio of tagged to untagged flies caught in the traps was 1.11 for *Musca domestica*, 1.70 for *Phaenicia* spp., and 1:7.88 for *P. regina* comprised approximately 50 per cent, *Phaenicia* spp. 19, and *M. domestica* 7 per cent of the total number of flies caught. Traps set in barnyards caught several times as many house flies and *Phaenicia* as those set in open fields.

The use of radioactive phos-

phorus as a means of tagging flies has proved satisfactory and reduces the amount of work in examining large catches of flies over that necessary when pigmented dusts are used to color the insects.

Cotton Insect Control

Three insecticides, toxaphene, aldrin and dieldrin in both spray and dust formulations were used against cotton thrips in a split-plot randomized block experiment. The sprays proved more effective than the dusts. Aldrin and dieldrin sprays, at rates of 0.08 and 0.09 pound per acre, were more effective than toxaphene applied at 0.73 pound per acre. Dieldrin showed more residual toxicity than either aldrin or toxaphene.

In another split-plot randomized block experiment, toxaphene, toxaphene-DDT and gamma benzene hexachloride - DDT dusts proved equally effective for boll weevil and bollworm control. The spray formulation of toxaphene-DDT was as effective as the dusts. Toxaphene and gamma benzene hexachloride - DDT sprays were not as effective as the toxaphene-DDT spray nor the toxaphene dust. In laboratory tests, toxaphene-DDT spray proved more effective than toxaphene spray for boll weevil control, particularly at the high levels of kill. The mixing of toxaphene and DDT did not increase the toxicity of the mixture for weevil control over comparable dosages of toxaphene and DDT applied separately.

In a randomized block experiment in which a heavy bollworm injury occurred, toxaphene and 3.5-40 dusts were equally effective and both dusts gave significantly better control than dieldrin dust, dieldrin spray, toxaphene spray or aldrin spray.

In the large plats results comparable to those of the small replicated plats were obtained. The results from the four tests with plats ranging in size from 1 to 40 acres indicate that sprays applied either with a tractor or an airplane were effective for boll weevil and bollworm control. In the tests, 6 to 12 applications

were required and average net gains in yields over the check plats ranged from 672 to 1223 pounds of seed cotton per acre, a net profit ranging from \$75 to \$133 per acre.

A comparison of Test Material #1¹ Compound R-242, Compound 923 and Compound K-6451 for spider mite control was made using both ground machine and airplanes to apply the sprays. The ground machine applications were more effective than the airplane applications. Test Material #1¹ was more effective than the other sulphur compounds used.

¹"Tests of Insecticides for Control of Cotton Insects during 1950"—J. C. Gaines, H. A. Dean, and Read Wipprecht, Texas Agricultural Experiment Station, College Station, Texas, in *J. of Economic Entomology*, June, 1951. (Vol. 44, No. 3)

Control of Beetle Larvae

Lead arsenate applied at rates of 1 and 2 pounds per 100 square feet as a top dressing on Kentucky bluegrass sod, gave very good control for four years and fair control the fifth year, the 2-pound applications being slightly more effective.

DDT used as a top-dressing on garden soil and worked into the soil 1 or 2 inches did not give effective control of grubs at applications of 60 pounds per acre.

Chlordane was not effective when used at application rates to 10 pounds per acre and Aldrin was not effective at 5 pounds per acre.

Benzene hexachloride (crude) applied at rates of $\frac{1}{2}$, 1, 2, and 3 pounds of the gamma isomer per acre to garden soil, and raked in 1 or 2 inches gave effective control at rates of 2 and 3 pounds per acre, and lindane at 2 pounds per acre gave fair control.

Parathion at rates of 3 and 4 pounds per acre applied to garden soil was an effective control and the 2-pound rate was nearly as effective. Parathion dust was effective when used on plant beds at the rate of 2 pounds of 1 per cent dust per 1,000 square feet.

"Control of Green June Beetle Larvae", by H. H. Jewett, in Bulletin No. 559, Kentucky Agricultural Experiment Station, Lexington, Ky.



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CPR-based insecticides are ideally suited for truck crops. They control the wide range of insects shown at the right — *yet leave no toxic residues*. No special processes are required to remove deposits from crops treated with CPR-based dusts. Washings ordinarily given fresh vegetables are sufficient.

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 Bean leaf hopper

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Diamond back moth
 Cabbage loopers
 "Old Fashioned Squash Bug"
 Squash lady beetle
 Striped cucumber beetle
 Spotted cucumber beetle

CELERY
 Lygus campestris
 Celery leaf tier

ASPARAGUS
 Common asparagus beetle
 Spotted asparagus beetle

TOMATOES
 Flea beetle
 Colorado potato beetle
 Blister beetle
 Fruit worm

POTATOES
 Colorado potato beetle
 Blister beetle
 Flea beetle
 Potato leaf hopper

BEETS
 Webworm

LETUCE
 Corn ear worm

SPINACH
 Leaf tier

BLUEBERRIES
 Blueberry fruit fly

ORNAMENTAL PLANTS
 Box elder bug

MISCELLANEOUS
 Clover seed head caterpillar
 Strawberry root worm
 Cherry fruit fly

INDUSTRY NEWS

Texas Gulf Sulphur Shifts Three Executives



W. H. ALDRIDGE

F. M. NELSON

T. S. LAMONT

TEXAS Gulf Sulphur Company, New York, has announced the elections of Walter H. Aldridge as chairman of the board, Fred M. Nelson as president of the company, and Thomas S. Lamont chairman of a newly-formed executive committee. Other members of the executive committee are Earle V. Daveler and Lowell C. Wadmond.

Mr. Aldridge had been president of the company since it began 32 years ago. He has long been a mining expert identified with the minerals development of the United States and Canada. Posts he held prior to his connection with Texas Gulf Sulphur in 1919 included: manager of The United Smelting and Refining Company; engineer in charge of the mining and metallurgical interests of the Canadian Pacific Railway which led to the emergence of the road as a leading Canadian smelter; founder of The Consolidated Mining and Smelting Company of Canada Limited, and president of Magna Copper Company.

The new president, Mr. Nelson, has been in charge of many of the firm's field operations since he joined the company in 1927. A graduate of the Colorado School of Mines, he obtained his primary mining experience in Colorado, Wyoming and Montana. With Texas Gulf Sulphur, he was put in charge of sulphur pro-

duction and exploration at mining sites in Texas and Mississippi. It was during this period that he invented the "Sulphur Trap", a device still used by the company.

Mr. Lamont, executive committee chairman, is vice-president and a director of J. P. Morgan & Co. Inc., and a director of a number of corporations. Mr. Daveler is vice president and a director of American Zinc, Lead & Smelting Company, and Mr. Wadmond a member of the law firm of White & Case. The three committee members also are directors of Texas Gulf.

Delaney Group Recesses

A recess has been called by the Delaney Committee which is expected to reconvene perhaps in the fall. The actual date was to be fixed in July. The Committee, established to investigate the use of chemicals in the raising and processing of foods, is expected to conduct subsequent hearings in different parts of the country, in locations near growing areas of various crops.

The last witness to be heard in Washington before the Committee adjourned, was Dr. E. L. Griffin, assistant chief of the Insecticide Division of the U.S.D.A. He discussed the enforcement of the Federal Insecticide, Fungicide and Rodenticide Act of 1947, stating that the act af-

fords greater protection to the public than did its predecessor, the act of 1910. He pointed out, however, that certain aspects of the 1947 act might be broadened to place responsibility upon applicants to prove the safety and efficacy of products being placed on the market.

Dr. Griffin's entire testimony had not been heard when adjournment came, and it was anticipated that he might be the first to be called when the Committee reconvenes.

May Expand Fla. Plant

Swift & Co., Chicago, is considering the expansion of its phosphate processing plant at Bartow, Florida, although definite plans have not been announced. The program, if carried out, would increase production by 50%, it is reported.

NACA Plans Fall Meeting

Program plans for the annual fall meeting of the National Agricultural Chemicals Association are taking shape satisfactorily, according to L. S. Hitchner, executive secretary of the association. The convention, scheduled for September 5-7, will be held as usual at the Essex and Sussex hotel, Spring Lake, N. J.

The first morning session will be devoted to talks by representatives of both the U. S. Dept. of Agriculture, the National Production Authority and the Office of Price Stabilization. The speakers are yet to be named. That night, the annual banquet will be held, with a guest speaker.

Committee meetings and specific reports and discussions are to be scheduled for Thursday, the NACA has indicated. Events for Friday have not yet been announced.

Reports by Mr. Hitchner and by NACA president Ernest Hart will be heard, and election of officers and directors are to be held.

New Post Created by Bemis

F. V. Deaderick has been named eastern director of sales of the Bemis Bag Co., a post cre-



F. V. DEADERICK

ated by the firm's officers to coordinate sales and services to Bemis customers located on the eastern seaboard. He will maintain offices in New York. Mr. Deaderick was formerly manager of the textile bag and multiwall paper bag manufacturing plants owned by Bemis at Houston, Texas.

He joined the company in 1918 in St. Louis, was made office manager of the bag manufacturing plant there in 1925, and was transferred to Houston in 1927 to assume management of the company's plant in that city.

The company also announces that R. V. Scott is now manager of the Bemis general sales division in Chicago, to succeed the late H. W. Clements. Mr. Scott joined Bemis in 1931 at Kansas City.

Succeeding Mr. Deaderick is G. M. Robb who joined Bemis in 1917 as a clerk in Houston. He has remained there since then, having served as chief clerk, office manager, salesman, and then sales manager until his recent appointment. Successor to Mr. Robb as sales manager of the Houston Sales Division is C. J. Hurst who joined Bemis in 1942 as a salesman in the Houston territory. L. W. Chenault has been appointed as assistant to Mr.

Robb in managing Bemis' two Houston plants.

New Fertilizer Plant

Phosphate Fertilizer, Inc., recently started construction on a new fertilizer processing plant in Kemmerer, Wyoming. The plant will use a process developed in Germany to produce 100 tons of fertilizer per day as well as a mineral supplement to be used for stock feeding.

MEETINGS

Annual Meeting to Consider Fertilizer Grades. Buccaneer Hotel, Galveston, Texas, July 19 & 20.

American Society of Agronomy, State College, Pa., August 13-15.

27th Annual Convention, National Shade Tree Conference Netherland Plaza Hotel, Cincinnati, Ohio, Aug. 27-31.

Diamond Jubilee Meeting, American Chemical Society, New York City, September 3-7.

National Agricultural Chemicals Association, Essex and Sussex Hotel, Spring Lake, N. J., September 5-7.

American Society for Horticultural Science, Minneapolis, Minn., September 5-7.

National Joint Committee on Fertilizer Application, held jointly with American Society for Horticultural Science, University of Minnesota, St. Paul, September 10, 1951.

12th International Congress of Pure and Applied Chemistry, New York City, September 10-13, 1951.

Annual Fertilizer Conference, Rutgers University, New Brunswick, N. J., September 27, 1951.

California Fertilizer Association, Hotel Californian, Fresno, Calif., November 1-3.

Cotton Mechanization Conference, Cotton Branch Experiment Station, Chickasha, Oklahoma, Nov. 8 & 9.

National Fertilizer Association Fall Meeting, Atlanta Biltmore Hotel, Atlanta, Ga., November 12-14.

Eastern Branch, AAEE, New Yorker Hotel, New York, Nov. 15 & 16.

Combined meetings of American Association of Economic Entomologists, Entomological Society of America; American Phytopathological Society; and the Potato Association, Netherland Plaza Hotel, Cincinnati, Ohio, December 9-13.

Northeastern States Weed Control Conference, New Yorker Hotel, New York City, Jan. 2, 3 & 4, 1952.

11th Annual Meeting, Northwest Vegetable Insect Conference, Imperial Hotel, Portland, Oregon, January 21-23, 1952 (David H. Brannon, Pullman, Washington, Secty.)

Shell Names Sutherland

The appointment of Harry K. Sutherland to assistant director of Shell Oil Company's Agricultural



H. K. SUTHERLAND

Laboratory at Modesto, Calif. was announced recently by Dr. Roy Hansberry, director of the Laboratory.

Mr. Sutherland has been with Shell for more than twelve years. Starting as a research chemist for Shell Development Company's Emeryville laboratories, he later engaged in technical administrative work at Emeryville and at New York where he has been since 1947. A native of Minnesota, he received his bachelor's degree from the University of Wisconsin and his doctorate from the University of Illinois.

USDA Names W. G. Bruce

The U. S. Department of Agriculture has announced that W. G. Bruce is now director of the Southeastern Region of the Bureau of Entomology and Plant Quarantine, with headquarters at Gulfport, Miss. In his position Mr. Bruce will direct the Bureau's regulatory, control, and administrative functions in Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, and Tennessee. The Region was one of five recently established in a reorganization of the regulatory, control and administrative functions of the Bureau to facilitate getting the best possible results from available manpower.

V-C Announces Shifts

Myron M. Keim, agronomist for Virginia-Carolina Chemical Corporation, is now located in the company's home office in Richmond, Va. Formerly of East St. Louis, Ill., Mr. Keim will continue to handle agronomic work for the midwest area and also for the areas covered by V-C offices at Baltimore, Md.; Carteret, N. J.; Norfolk and Richmond, Va. Frank E. Boyd, agronomist for the corporation in Montgomery, Ala., will continue to handle agronomic work for the southern area.

Fertilizer Meetings

Four Georgia fertilizer meetings were scheduled to be held during June according to an announcement issued by E. D. Alexander, Agricultural Extension Service agronomist recently. The meetings were to be held for fertilizer dealers, fertilizer manufacturers and agricultural workers, with programs to be conducted on the effect of nitrogen, potash, and phosphate in plant growth and the importance of obtaining a proper balance of these and other elements in obtaining maximum production.

The four meetings were scheduled as follows:

1. June 26—Dublin Country Club, committee in charge of local arrangements: W. W. Brunson and G. Y. Duke.

2. June 27—Gordon Hotel, Albany, committee in charge of local arrangements: O. D. Culpepper and J. D. Davis.
3. June 28—Conner Hall, College of Agriculture Campus, Athens, committee in charge of local arrangements: Malcolm A. Rowe and Francis Bowen.
4. June 29—Camp Fulton, Atlanta, committee in charge of local arrangements: W. D. Barton and S. D. Truitt.

Toxaphene Mailable Now

Toxaphene has been classed as mailable under section 35.15(c), Postal laws and Regulations, 1948, with packaging as prescribed in Section 35.18(d)(6) as amended, and with quantity restriction of not to exceed 4 ounces of the solution (25% or above), or not to exceed 5 pounds of the dry form, in one parcel, the U. S. Post Office Department has announced. (Postal Bulletin of May 29, 1951)

Dry preparations containing a low percentage of toxaphene as the active ingredient and without other toxic ingredients, on which a caution label is required under the Federal Insecticide, Fungicide and Rodenticide Act, may be accepted in quantities not exceeding 10 pounds in one parcel unless packaged in 1-pound containers when a 12-pound restriction applies.

New Firm Locates in West

Formation of the Wilson Meyer Co. in San Francisco has been announced. The new firm will handle technical services, sales and distribution of Eastman industrial chemicals in the western states. Among the materials to be handled are triethyl phosphate for use in agricultural insecticides; and manganese sulfate for fertilizer materials. The new firm is under management of Wilson Meyer, also president of Wilson & Geo. Meyer & Co., San Francisco. It will be located at 333 Montgomery St., San Francisco.

Potash Institute Moves

American Potash Institute, Washington, D. C., has announced a change of address. The new location is at 1102 16th St., N. W., Washington 6, D. C., only a few doors from the former address of 1155 16th St. Dr. H. B. Mann is president of the Institute.

New Mo. Plant Erected

Brunswick, Missouri, has been selected as the location for an anhydrous ammonia fertilizer plant to be erected by Missouri Growers, Inc., Carrollton, Mo. In charge of the plant is Clyde Elliott, L. M. Manson, Brunswick, and M. H. Carpenter, Mendon, Mo., are dealer-appli-cators.



American Forestry Ass'n Honors Dr. Schenck



George W. Merck, president of the Manufacturing Chemists' Association and S. L. Frost, executive director of the American Forestry Association, on June 21st, presented Dr. Carl A. Schenck, known as the "grand old man of American forestry," with a redwood key inscribed "Key to unlock the door of the

Calvalcade of American Forestry." Dr. Schenck, who now lives in Germany, is making an extended tour of the United States under the auspices of the American Forestry Association. Shown in photo, left to right, are Mrs. George W. Merck, George W. Merck, Dr. Carl A. Schenck, S. L. Frost, and P. P. Willis.

Totman Honored at Maine

James E. Totman, newly re-elected chairman of the board of the National Fertilizer Association and president of the Summers Fertilizer Co., Baltimore, Md., was presented the honorary degree of Doctor of Laws by the University of Maine, Orono, at its recent commencement exercises. The degree was awarded "in recognition of his outstanding business achievements and his loyal and constant interest in the university."

Armour Names Div. Mgr.

H. G. Wells, former "Vertagreen" sales manager at Armour Fertilizer Works, Atlanta, Ga., has been made manager of the firm's Atlanta division. Mr. Wells will be succeeded by Howard W. Rabb who will also continue as advertising manager.

Defends Pesticide Use

Speaking before the national meeting of the Institute of Food Technologists in New York City, June 20, L. S. Hitchner, executive secretary, National Agricultural Chemicals Association, emphasized the essentiality of pesticides in food production and in the National Defense Program.

"The use of pesticides in the production of food is essential if we are going to enjoy the highest quality, the largest variety and a continued abundance of foodstuffs. The alternative, (without the use of pesticides) is fewer varieties of foods, poorer quality, higher cost, diseased and wormy food.

Mr. Hitchner stressed the fact that the choice of quality and abundance of food lies with the consumer. He quoted scientists and government officials to substantiate his remarks on the contributions of pesticides to increased production. Commenting on congressional investigations into chemicals used in and on foods and the possible hazard to health, the NAC secretary scored the wide publicity given unsubstantiated testimony by "extremists" and stated, "if the products are used as directed by the manufacturer on the label, no undue hazard is involved."

He quoted Drs. Paul A. Neal and Wayland J. Hayes, U. S. Public Health Service, as saying, "To the best of our knowledge, there have been no substantiated cases of DDT poisoning in this country resulting from ingestion of foods containing DDT as a residue."

Mr. Hitchner stated that existing controls on sale and distribution

of pesticides are adequate to protect the public health and that the Food and Drug Administration has the authority at the present time to seize food which the administration considers excessively contaminated.

Antara Grants Fellowship

Antara Products Division, General Dyestuff Corp., New York has announced the establishment of a fellowship in the amount of \$4000 at the agricultural experiment station, Rutgers University, New Brunswick, N. J. The program will include a broad study of surfactants in increasing the lethal power of herbicides.

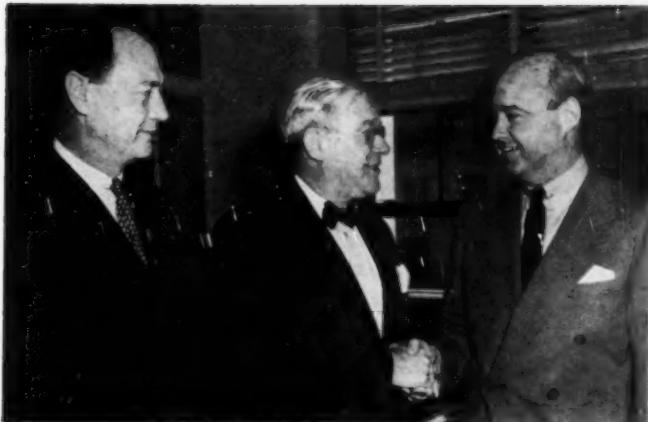
Cal Feed Firm Reorganizes

International Fertilizer and Feed Co., Bakersfield, Calif., recently announced a reorganization of the board of directors. Resigning from the board as a result of transfer of ownership were Frank Jeppi and W. B. Camp, Sr. They were replaced by Sam H. Rudnick and Donna Amenta. Officers of the reorganized board now include: Harry Amenta, president; Oscar Rudnick, vice-president; Grant P. Border, vice-president in charge of the grain division; Herman L. Boyd, secretary; Sam J. Amenta, assistant secretary; and Sam H. Rudnick, treasurer.

The company was organized after World War II and has expanded consistently according to the report. The company operates grain elevators, dehydration plants and warehouse facilities and sells fertilizer and feeds.

Joins R. S. Aries in N. Y.

Howard Berry, formerly vice-president, treasurer, and director of Mathieson Chemical Corporation has joined R. S. Aries & Associates, New York consulting engineers and economists, as senior associate. Mr. Berry has completed 28 years of service with Mathieson in an executive financial capacity, first as vice-president and comptroller and in later years as vice-president and treasurer. The Aries organization specializes in the chemical process industries.



Thomas S. Nichols (right) who recently resigned as Deputy Administrator of the NPA to resume his duties as president of Mathieson Chemical Corp., Baltimore, congratulates Francis J. Curtis (vice president Monsanto) center and Kenneth H. Klipstein (Calco Chemical Div.)

American Cyanamid Co., Bound Brook, N. J.) upon being sworn in as key members of the NPA staff. Mr. Curtis takes the post of Assistant Administrator to head the Chemical, Rubber and Forest Products Bureau and Mr. Klipstein directs the Chemical Division of the NPA.

Cal Essay Contest Winners

The Soil Improvement Committee of the California Fertilizer Association, Los Angeles, recently announced the winners of their 1951 essay contest on "Methods of Applying Fertilizers In California". Students from six junior colleges in Southern California participated in the contest, which is designed to stimulate the interest of vocational agriculture students in the proper use of complete and balanced fertilizers. The president of the association, James M. Quinn, announced the winners: First Grand Prize and pos-

session of the perpetual trophy for one year went to Robert Merriam, a student at Chaffey Junior College; second prize to Stuart McLeod and third grand prize to Jerry Gingerich. Other awards were presented to winners in their respective schools.

Fertilizer Exec Dies

Herbert A. Lynch, 64, vice-president and secretary of the Acme Fertilizer Co., Wilmington, N. C., died May 30 after a brief illness. He had been connected with the Acme firm since 1931, and in addition to his business connections in

the community had been active in civic affairs. He was at one time president of the Chamber of Commerce and chairman of the board of education in Wilmington.

USDA Entomologist to C.R.

P. A. Berry, entomologist with the United States Department of Agriculture, recently left for El Salvador to assist El Salvadoran scientists in the control of insects in that country. The assignment was made at the request of the Government of El Salvador under the Point Four program of the United States, which calls for sharing technical abilities with other countries. Mr. Berry will join six other specialists from the U. S. at a jointly-operated agricultural experiment station.

Int. Minerals Names Two

John W. Rutland has been appointed general manager and Joe F. Stough sales manager of the Plant Food Division of International Minerals & Chemical Corporation, Chicago, according to Maurice R. Lockwood, vice president in charge of the division. Mr. Rutland, who has been with the company 30 years, has been general sales manager of the Plant Food Division since 1950. Mr. Stough began his service with the company 26 years ago and has been general manager of the northern region of the Plant Food Division since 1948.



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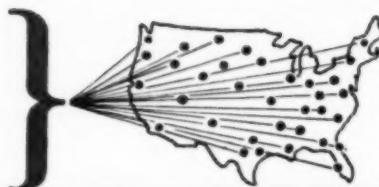
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To Chem. of Colo. Pest

Mervyn G. Oakner has been named advertising manager of the Chemical Corporation of Colorado, Denver, manufacturers of "Colorado .44" insecticides, herbicides and other agricultural chemicals. Mr. Oakner will work with the company's new export subsidiary, the Export Chemical Corporation of Colorado, in expanding South American markets and increasing national consumer promotion through export advertising.

A graduate of the University of Denver, Mr. Oakner has been associated with editorial and advertising work for the past several years.

Oakner will direct the company's advertising and sales promotion department. Sales promotion already has begun for the South American markets where the company plans to have complete distribution with branch offices in Mexico, Peru, Brazil and Venezuela. Mr. Oakner will coordinate the corporation's national sales efforts with advertising in order to further expand the already established major city markets.

The company has also announced that Joseph L. Flores was appointed director of exports for the Export Chemical Corporation of Colorado, a subsidiary. He was to begin expansion of the new export corporation in June by setting up distribution in Mexico with a branch office in Mexico City.

2,4-D Regulations Proposed

Final hearings on proposed regulations regarding the sale of 2,4-D and related herbicides were scheduled to be held by the Arkansas State Plant Board, Little Rock, on June 13. The proposals were authorized by a law passed by the 1951 legislature. The original set of proposals was discussed at a preliminary public hearing last May 21 at which time representatives of manufacturers, dealers, and custom-sprayers made suggestions which resulted in redrafting the proposals.

The proposed regulations govern sales and use of these herbicides by manufacturers, dealers or

agents, custom-sprayers and persons spraying their own crops or brush.

Beg Your Pardon

It has been pointed out to Agricultural Chemicals that an error occurred in the article on State Insecticide Laws appearing in our June issue. Under "California", it was stated: "Fee \$5.00 for one to ten economic poisons". This should have read "\$50.00" instead of \$5.00.

We regret this misprint and apologize to California control officials for the confusion which may have resulted from our error.

—The editors

CFA Plans Fall Meeting

Sidney H. Bierly, Executive secretary and manager of the California Fertilizer Association, Los Angeles, has announced that the group's annual convention will be held at the Hotel Californian, Fresno, November 1-3. The program is being developed, Mr. Bierly says, and speakers are expected to include nationally-known figures representing both government and the fertilizer manufacturing industry.

Burlap Demand Low

A stalemate in burlap trading exists to such an extent today that many Indian shippers no longer notify importers in this country of pending shipments, according to market spokesmen. Factors are numerous, but the recent Government order CPR-40 is not entirely to blame, it was stated. Apparently the deadlock will exist until September or October, when the new jute crop begins to come through.

Demand in the domestic market is almost nil and was so before the new CPR-40 established maximum purchase and resale prices in this country. A very short supply of raw jute exists and as a result high prices and outside competition have made American bag manufacturers look elsewhere for cheaper substitutes. Bag manufacturers cannot operate profitably at prevailing ceilings and are turning more and more to other materials.

To Represent Velsicol

George K. Schumaker has been appointed eastern sales representative, Velsicol Corporation, In-



GEORGE K. SCHUMAKER

secticide Division. His headquarters will be in the Velsicol New York office, 100 East 42nd St. Schumaker was graduated from Pennsylvania State College, receiving his degree of Bachelor of Science in Organic Chemistry. He subsequently received a Master's degree in entomology from the University of Illinois.

Fertilizer Bill Introduced

A bill which would require that fertilizer materials shipped across state lines should be inspected and registered by the U. S. Department of Agriculture, was introduced to the Senate on June 18, by Sen. William Langer (R), North Dakota. Disposition of the bill had not been announced at press time.

G. C. Crossley Dies

George Corliss Crossley, 69, president of United Clay Mines Corp., producers of agricultural diluents, Trenton, N. J., died June 8, 1951 as a result of injuries suffered in an automobile accident. Mr. Crossley was born in Trenton and lived there at the time of his death. He attended the Steward School of Business Administration and the Drexel Institute of Technology. After finishing school he apprenticed in various machine shops and foundries. Later, he erected mining equipment in several southern mines.

CFA Asks for CPR Relief

The California Fertilizer Association, Los Angeles, recently sent the following letter to Michael V. DiSalle director of the Office of Price Stabilization, asking that fertilizer mixers in the state be spared the inconvenience of being forced to comply with the "confusing and often contradictory CPR-22". The letter, signed by J. M. Quinn, CFA president, read as follows:

"The California Fertilizer Association appeals to you on behalf of the

fertilizer industry in California to defer the application of CPR-22 to our industry, at least in California, until the tailored fertilizer and insecticide price order now being drafted can be placed into effect. With few exceptions our industry is composed of small concerns who find the terminology of CPR-22 to be so confusing as to make intelligent compliance almost impossible. Our Active Members are not manufacturers, but actually mixers and distributors of commercial fertilizers, whose sale of mixes has been arbitrarily placed under CPR-22.

"Initially, our direct sales to the farmers were exempted from CPR-22, but on May 30, or thereabout, your of-

ice came out with a new interpretation under which sales in this category are to be considered commercial and not retail sales, and so, subject to CPR-22. This is just one example of the type of confusion which exists with regard to this Regulation. Further, we understand that we in California will lose some of our present sources of basic material supply if CPR-22 is invoked and, if this should happen, our important service to California's vital agricultural economy will suffer.

"The recent history of fertilizer prices across the nation is excellent. R. M. Salter, Chief, Bureau of Plant Industry, Soils and Agricultural Engineering, recently wrote: The 1948 price index of fertilizer costs compared with the index of other prices paid by farmers shows that fertilizer prices have advanced much less than prices paid for other commodities. The index price of fertilizers in 1948 was only 23 points higher than in 1925, as compared with an increase of 124 points in feed prices and 108 points in prices paid for all commodities. He points out that in the interim, technological advances have resulted in better quality fertilizer. This would indicate that the industry is more than willing to cooperate in your efforts to keep prices from getting out of hand.

"In view of the hardship involved in the application of this order on the vast majority of our industry, the possibility of a reduced supply to our farmers, and due to the fact that General Ceiling Price Regulation establishes hard and fast price ceilings, under an even less flexible formula than does CPR-22, we respectfully request that we be allowed to continue under GCPR, which we can understand and intelligently comply with, until our industry order is in effect. We point out that a precedent has already been established in the postponement of the effective date of CPR-22 from May 28 to July 2. We understand that the order to cover the fertilizer and insecticide industries should be in effect later in the summer."

Japan Fertilizer Output Up

Japan will be in a position to export fertilizers to Korea and Formosa this year because production has exceeded expectations. Output of nitrogenous fertilizer reached approximately 2,500,000 metric tons in 1950-51 and phosphoric fertilizers about 1,500,000 metric tons.

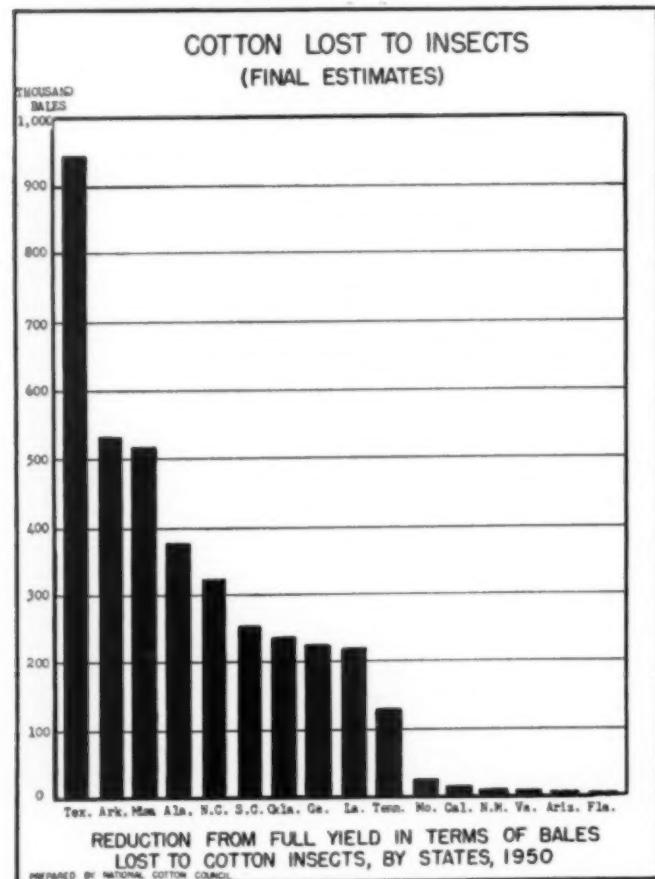
Top L.A. Fertilizer Bid

The Board of Public Works, Los Angeles, announced a top bid of \$10.16 a ton for sludge fertilizer from its new sewage treatment plant at Hyperion. The plant is expected to have a capacity of approximately 77,000 tons of fertilizer yearly.

Cotton Council Portrays Losses to Insects

THE National Cotton Council, Memphis, Tenn., recently published figures showing the depredations of insects on the cotton yield. Final estimates have now been made, the Council states, and the graph be-

low tells the story of thousands of bales of cotton lost during the past growing season. Texas, it will be noted, suffered the greatest losses with Arkansas and Mississippi not far behind.



Suppliers' Bulletins

New Velsicol Bulletin

Velsicol Corp., Chicago has issued a new bulletin on chlordane for chigger control. The bulletin, number 44 issued in April 1951, describes the activities of the chigger and gives recommendations for its control with chlordane. The rate of application varies with the type of material used, but the bulletin indicates that emulsion sprays give the best results.

New DuPont Manual

Grasselli Chemicals Department, E. I. duPont de Nemours & Co., Wilmington, Del. has announced that a manual on methods and results of chemical brush and weed control is available. Included in the manual are records of brush control experience by telephone companies, power companies, railroads, highway departments, drainage and irrigation districts, a tree expert company and others. The manual is illustrated and punched for three-hole loose-leaf note books.

Flexible Conveyor Unit

Flexovveyor Mfg. Co., Denver, Colo., is marketing a power-driven telescoping boxcar loader for handling bagged materials. The equipment consists of a series of endless spring belts operating over grooved steel loaders. The conveyor can be bent into any curve up to a 90° angle while under power, allowing it to go around doors and into the corner of the freight cars. Descriptive literature is available from the company, 1220 S. Acoma St., Denver 10, Colo.

Vibrator Stops Arching

Martin Engineering Co., Kewanee, Ill., is manufacturing a new type vibrator used in the movement of granular chemicals and other materials which tend to arch and resist movement toward the outlet of

hoppers and bins, or where wet mixtures tend to entrain air. E. F. Peterson, president of the company, has been granted three new patents on the product which is said to be easily mounted, available in a number of sizes and requires practically no maintenance. Further information is available from the company.

New Baughman Bulk Body

Baughman Manufacturing Co., Jerseyville, Ill., has announced the



new bulk material handling body pictured here. The company states that the body will discharge bulk material as high as 16 feet above the ground when mounted on a 39 inch truck frame. Two 6 inch horizontal screws in the bottom of the body convey the material to a 12 inch vertical double flight screw which carries it to a 9 inch auger conveyor mounted on the top of the body. Body capacities range from 325 cubic feet to 1375 cubic feet and the body will unload at the rate of $\frac{1}{4}$ ton to 1 ton per minute, depending on the material handled. All controls are at ground level and the auger conveyor is lowered and raised by a hydraulic pump and ram. The bodies are available in 15 sizes for trucks and trailers.

New Hyman Circular Out

Julius Hyman & Company, Denver, Colorado, has announced publication of a new piece of litera-

ture, Circular 300, "Current Use Status of Aldrin and Dieldrin." This circular contains a summary of effective dosages of Aldrin and Dieldrin for control of several major pests. Copies are available from the company.

New Respirator Available

Mine Safety Appliances Co., Pittsburgh, Pa., has announced the development of a redesigned respirator, the Compact Confo. According to the company, the new respirator features a new type mineral wool filter which requires less than half the filter area and offers only half the breathing resistance of previous models with the same dust collecting area. Filter holders are smaller in diameter and shallower in depth to allow for better vision. The filter covers snap on and off for faster filter changing. The new models have a one-piece headband.

Research Story is Told

"This is duPont—The Story of Research" is the title of a new brochure published by E. I. duPont de Nemours & Co., Inc., Wilmington, Del., picturing in considerable detail the behind scenes activity in connection with the firm's broad research projects. Thoroughly illustrated with photos of research personnel and pictures of buildings and other equipment, the brochure presents research as the basis of all scientific achievement, pointing up its importance in the making of new pesticides as well as other materials.

Raymond Pulverizer Info.

Raymond Pulverizer Division of Combustion Engineering-Super heater, Inc., Chicago, has issued a new illustrated bulletin on its line of Raymond mills for insecticides and sulfur grinding. Designated as bulletin 68, the folder contains cut-away photographs and drawings of the mills, including the "whizzer separator" which returns oversize material to the grinder. All finenesses of finished formulations and sulfur commonly used from about 80% passing

(Turn to Page 93)

NPA Classifies Chemicals

A list of chemicals divided into their relative availability was published in June by the Department of Commerce, National Production Authority, Salvage and Reclamation Division. Under Group I, materials in "very short supply", the following chemicals were listed: freon, sulfur, sulfuric acid, and tetramethylthiuram disulfide. The NPA states that alternates should be selected for all of these materials whenever possible.

Under Group II, materials in "tight supply", these chemicals were listed: chlorine, DDT, dieldrin, "Dithane", fumigants, hexaethyl tetraphosphate, paradichlorobenzene, para-thion, toxaphene and zinc chemicals.

Group III is designated as comprising chemicals in "fair supply". Under this head were listed chlordane, dithiocarbamate fungicides, paris green, pyrethrum, rodenticides, rotenone, sabadilla and herbicides.

These materials classifications were determined in collaboration with the Industrial Economics Division of Policy Coordination Bureau and the various Materials Divisions of NPA; and the Office of Materials Resources of the Munitions Board. In making this compilation, it was assumed that the mobilization program will be continued as planned, the NPA states.

Factors determining the classifications included their availability, sources, (domestic or foreign), transportation required, production capacity and manpower. Possible demand for the materials was estimated taking into consideration military requirements, stockpiles, domestic industries and the civilian economy.

Int. Minerals Makes Grant

International Minerals and Chemical Corp., Chicago, has given a grant of \$2400 to the University of Georgia Horticultural Division, Athens, it was recently announced by Dean and Director C. C. Murray of the College of Agriculture. The grant was given for basic research to determine the role of magnesium and potassium in peach tree nutrition and the work will be carried on by a graduate student working un-

der the direction of Dr. F. F. Johnstone, Jr. chairman of the horticultural division.

Hammond Names Greiner

M. E. Greiner, vice-president and general manager of the Hammond



M. E. GREINER

Bag & Paper Co., Wellsburg, W. Va., has been elected a director of the company. Mr. Greiner joined the Hammond organization as western sales representative in 1936 and was transferred to the main office in 1937. The firm has plants at Wellsburg and Pine Bluff, Arkansas. It manufactures multiwall paper bags for fertilizers and other chemicals.

DuPont Article on Potash

E. I. DuPont de Nemours & Co., monthly magazine for July, 1951 contains an article on "Pioneering in Potash" by Robert H. Walton and F. M. Raffo. It describes the discovery of potash in the United States by a crew drilling a wildcat oil well and follows through with the development of the potash industry in this country.

Forbath Honored at Dinner

Thomas P. Forbath, director of research and development and a supervising engineer of Chemical Construction Corp., New York, was recipient of one of the Chemical Engineers of Greater New York awards, which was presented at a dinner meeting held Thursday, June

7 in the McGraw-Hill dining room. The presentations were made by Sidney D. Kirkpatrick, editorial director of *Chemical Engineering* and *Chemical Week*. Mr. Forbath was cited for his contributions to a new process of sulfur extraction from low-grade ore.

New Penick Insecticide

S. B. Penick & Co., New York, has announced a new insecticide, Ryanexel 15-O.5, for the control of cranberry fruitworm and European corn borer. The insecticide contains 15 percent ryania and 0.5 percent n-propyl isome.

Experiments in 1949 indicated that there was a synergistic action between the two materials. According to the report, the following year the mixture was improved by impregnating the ryania with n-propyl isome before extending with pyrophyllite or talc.

n-propyl isome was selected from a group of insecticidal materials prepared and reported by two workers at Boyce Thompson Institute, Yonkers, in 1945 and developed commercially by S. B. Penick & Co.

May Extend Beetle Area

The U. S. Department of Agriculture has proposed that the Federal Japanese beetle quarantine be continued, and also that the State of North Carolina be added to the quarantine area. The Department's decision was reached after thorough study of testimony at a public hearing in Washington on March 30. The hearing was called after suggestions had been made that Federal control of the Japanese beetle should be discontinued.

In connection with its proposal to add North Carolina to the quarantine area, the Department proposes to place more than 40 counties of that State under active regulation to prevent spread of the Japanese beetle, and also to extend the present regulated areas in New York, Ohio, Pennsylvania and West Virginia to include all important infestations discovered in nonregulated sections of these States.

New Pitts. Ag. Office

Pittsburgh Agr. Chemical Co., New York, has announced the opening of a new office in Dallas, Texas,



HUGH W. SWINK

to handle sales territories of Oklahoma, Texas, Louisiana, Mississippi and Arkansas. In charge of the new branch will be Hugh W. Swink, a graduate of Oklahoma A. & M. College of Agriculture. Mr. Swink was formerly head of the weed and brush control program of the Oklahoma State Dept. of Agriculture and during the war he served in the U. S. Navy as a physical training officer. He joined the Pittsburgh organization on June 1.

Thornton Appointed to MRI

Midwest Research Institute, Kansas City, Mo. has announced the appointment of Dr. M. H. Thornton as associate director of chemistry. Dr. Thornton, an authority in the field of agricultural and industrial chemistry, will coordinate the activities in this field at the Institute, where he has been a staff member since 1946.

Reports Fertilizer on TVA

James A. Pope, a director of the Tennessee Valley Authority recently sized up the benefits of increased fertilizer use while speaking before the Southwest Virginia Agricultural Association at Abingdon. Stating that TVA has produced about 2.95 million tons of fertilizer since this government project first

started operations, he reported that 450,000 tons had been used on 67,000 demonstration farms and the remaining 2½ million tons had been distributed over the nation by the Department of Agriculture, co-ops, and commercial dealers. Striking results were shown on the demonstration farms in the Tennessee Valley where the program was in effect for about ten years. Farm acreage increased 14% while the crop-land acreage increased about 3%.

Corn yield, Mr. Pope stated, increased from 26 to 42 bushels per acre. Cotton yield per acre increased 43%.

New Name for Mig. Firm

Hayes-Sammons Co., Mission, Texas, has announced that it has changed its name to "Hayes-Sammons Chemical Co." The firm manufactures "Mission Brand" insecticides, fungicides and fertilizers. It will continue as a Texas corporation with the same stockholders, directors and officers, it is announced by Thomas B. Sammons, Jr., vice-president.

Bourbeau on Long Tour

Dr. Gerard A. Bourbeau of the Soils Department of The Connecticut Agricultural Experiment Station, has been granted a year's leave of absence from the Station to serve on an expedition to the Belgian Congo for the Economic Cooperation Administration. The expedition left the U. S. on June 10.

"Deficiency" Letterheads

Coke Oven Ammonia Research Bureau, Inc., Columbus, Ohio, announces that a new printing is being made of the "nutrient deficiency" letterheads which feature on the left hand side of the page four colored pictures showing a corn deficient in nitrogen, phosphoric acid and potash, and also suffering from drought. Firms are invited to order quantities of personalized letterheads printed on this stock. Details may be obtained from H. H. Tucker, Coke Oven Ammonia Research Bureau, Inc., 8 E. Long St., Columbus 18, Ohio.

Mattson Joins Penn-Salt

Kirk C. Mattson has joined Pennsylvania Salt Mfg. Co. of Washington as district sales manager



KIRK C. MATTSON

of the company's Los Angeles office. Mr. Mattson will supervise sales and service of the Industrial Chemicals and Agricultural Chemicals Departments in Southern California, Arizona, Nevada and New Mexico.

Mr. Mattson assumes his new position after 15 years' experience in the marketing of industrial and agricultural chemicals in California. Until recently he operated his own chemical sales agency, the Mattson Chemical Company, in Los Angeles. A native of Berkeley, California, he now lives in San Marino.

LeBaron Appointed

Dr. I. M. LaBaron has been appointed director of research laboratories for International Minerals and Chemical Corp., Chicago, according to an announcement by Dr. Paul D. V. Manning, vice-president of the corporation in charge of research. Dr. LeBaron has been research engineer with the corporation since 1942.

Davison Ups Smith

H. Alexander Smith, Jr., house counsel of The Davison Chemical Corporation, has been appointed by the board of directors to the additional post of assistant secretary of the corporation. Mr. Smith is a graduate of Princeton University and the Yale Law School.

Recently-Issued Bulletins

Controlling Grasshoppers in Alfalfa with Chlordane and Toxaphene Sprays, by R. L. Shotwell, Division of Cereal and Forage Insect Investigations, United States Department of Agriculture, Number E-819, published in May, 1951, 19 pages plus two pages of maps.

List of Publications, published by New York College of Agriculture at Cornell University, Ithaca, listing all publications available from the college. Cornell Extension Bulletin 47, revised April, 1951, 31 pages.

Insect Pest Summary, published by the Agricultural Research Administration, Department of Agriculture. A review of insect conditions in 1950, 28 pages plus six maps.

Frontiers of Plant Science, published by the Connecticut Agricultural Experiment Station, New Haven, Spring Issue, May, 1951, eight pages. Contains articles on "What Makes a Good Insecticide"; "The Role of the Chemist in Civilian Defense"; "Tobacco Curing Research in Connecticut", and "Chemotherapy Scores Again".

Status of Imported Parasites of the Japanese Beetle in 1950, by J. L. King, L. B. Parker and H. J. Willard, Division of Fruit Insect Investigations, United States Department of Agriculture. Special Supplement (1951, No. 5) of Insect Pest Survey, issued June 5, 1951.

Tests With Benzene Hexachloride for the Control of Insects Attacking Peanuts, 1946-1949, by F. W. Poos and T. N. Dobbins, Division of Cereal and Forage Investigations, Department of Agriculture, and E. T. Batten and G. M. Boush, Virginia Agricultural Experiment Station. Number E-820, published May, 1951, 16 pages.

1951 Weed Control in Field Crops, by Stanford N. Fertig, Cornell Extension Bulletin 821, February, 1951. A chart containing the 1951 chemical weed control recommendations.

1951 Spray Schedules For Fruit Trees, by W. D. Mills and A. A. Laplante, Cornell Extension Bulletin 812, February 1951, 24 pages. Lists the various sprays for apples, cherries, pears, quince, plum and prune.

Chemical Weed Control in the Vineyard, by Nelson Shaulis and D. R. Dugan, Cornell Extension Bulletin 816, January 1951, 7 pages. Recommendations for materials for use in spraying vineyards with di-nitro sprays.

Mechanics of Feeding of the Greenbug on Hordeum, Avena, and Triticum, by R. M. Chatters and A. M. Schlehuber, Oklahoma Agricultural Experiment Station Technical Bulletin No. T-40, June, 1951, 18 pages.

New Insecticides for Controlling External Parasites of Livestock, compiled by E. F. Knipling, Division of Insects Affecting Man and Animals, Department of Agriculture, Number E-762, Second Revision, published in June, 1951, 28 pages.

INSECT SITUATION

(Continued from Page 73)

Reports from other States during early June showed that oviposition had started throughout the Corn Belt, but that in general, egg laying was light as the corn fields lacked sufficient height to attract the moths. In most of the corn areas in the mid-west, development of the insect seemed to be slightly ahead of corn development. Reports from Indiana the first week of June indicated that most corn in the Evansville and Indianapolis areas was too small to receive many eggs at the peak of moth flight. Relatively few moths had emerged in Iowa by the first week of June and no oviposition was reported. Emergence was nearly complete in Kansas by the end of the first week of June, but few egg masses were reported except from

Leavenworth, Wyandotte, and Douglas Counties in the northeastern part of the State. At that same time, emergence was nearly completed in Missouri, but no egg masses had been found, and moths were just beginning to emerge in parts of Minnesota and South Dakota. Egg masses ranging up to as many as 52 per 100 plants were reported from some southwestern Ohio counties the first week of June. In New Jersey, moth emergence was well under way at the end of May and eggs were being found.

Vegetable and Truck Crop Insects

Mexican bean beetle populations were generally light to moderately heavy during the last part of May and the first half of June in coastal regions from New York to Mississippi, and also in Tennessee. They seemed to be somewhat heavier in some areas toward the middle of June. The bean leaf beetle was numerous on beans during that period in Delaware, Virginia, Tennessee, South Carolina, and Mississippi.

Infestations of cabbage caterpillars showed general increases during the last half of May and were characterized as "moderate to heavy" in parts of Delaware, Maryland, North and South Carolina, Alabama, and southern California. Local heavy infestations occurred on cabbage in Tennessee early in June, but in all other districts reporting the populations were classed as generally light to moderate during the first half of the month.

Heavy local infestations of the pea aphid were reported from the Geneva section of New York during the first half of June. This insect had become sufficiently abundant on peas in southern and south central Wisconsin as to require extensive insecticide applications. In general, pea aphid populations were generally light to moderate on peas in Minnesota and in the Blue Mountain district of Washington—Oregon. Insecticide applications were being required in some fields in those areas. Infestations were light on peas in central Washington.

Aphids on tobacco were widely distributed during the first half of June in Georgia and Florida. Fre-

AGRICULTURAL CHEMICALS

Ups Chlorine Production

The Solvay Process Division, Allied Chemical & Dye Corporation, has announced that it will shortly commence construction of a new mercury cell chlorine-caustic soda unit at its plant near Syracuse, New York. The new plant will involve an expenditure of some \$10,000,000 and will about double capacity of Solvay's Syracuse facilities.

SULFUR

(Continued from Page 67)

sibility of setting a percentage of fertilizers to go into mixes. There was some talk of freezing at the 1949-50 level, the amounts of fertilizer going to mixers in the eleven western states, but there was no decision at press time late in June.

The Department expects to work with state and industry groups in regional conferences to discuss the problems peculiar to different sections of the country. Emphasis will be on education of the farmer, rather than forcing restrictions on his activities. They will be shown how to conserve phosphates by utilizing new fertilizer grades and will also be warned that new mixtures may have less phosphate in the formula than was formerly used.

METHOXYCHOR

(Continued from Page 41)

depending on when flies infest the premises again. Protection for 2 to 3 months can be obtained by spraying barns and premises with 2-2½% methoxychlor.

Use on Crops

Methoxychlor is notably safe on many highly sensitive plants, including cucumbers, melons, squash, and beans. Tomatoes also are not injured by methoxychlor. Limited work indicates that methoxychlor is safe to plants when applied to the soil.

Methoxychlor is compatible with most of the commonly used fungicides, such as sulfur, Bordeaux mixture, the fixed coppers and the dithiocarbamates.

Flavor of treated crops is not according to tests conducted to date, adversely affected by methoxychlor, including those of Younkin ²² on tomatoes.

Residues

The residual effectiveness of methoxychlor against many crop insects exceeds that of rotenone and approaches that of DDT.

Along with other insecticides being investigated at hearings (FDC-57) concluded in 1950 by the Food and Drug Administration, methoxychlor has as yet been awarded no official residue tolerance. Testimony at these hearings in behalf of the advantages of methoxychlor indicates that this material has reacted favorably with federal and state investigations.

On the basis of many residue analyses in the past two seasons normal use of methoxychlor as sprays or dusts will result in harvest-time residues of less than 10 p.p.m. on the following crops (fresh): sour cherries, green beans, apples, cabbage, pears, tomatoes, corn, apricots and alfalfa. Lehman ¹⁴ has indicated that this tolerance would probably not be unreasonable. The effect of processing and canning has also been studied, and residues to date have not exceeded 0.2 p.p.m. of methoxychlor in canned green beans, tomatoes, corn, lima beans, potatoes and carrots.

Extensive laboratory and field evaluation during the past four years has shown that methoxychlor controls a number of insects which attack crops.

Vegetable crops, such as snap and lima beans, squash, cucumbers, melons and tomatoes head the list of those on which methoxychlor is useful. Its use on fruit crops, such as peaches, early apples, cherries, bramble fruits and grapes, holds considerable promise. Methoxychlor is also effective against a number of insect pests of forage crops, where residue hazards might be involved with more toxic insecticides.★

The author is indebted to W. H. Tindale and to H. F. Diets, A. H. Goddin, and other members of the Pest Control Research Laboratory of the Grasselli Chemicals Department for permission to use biological data

reported, and their kind criticisms, suggestions and comments made on this presentation. Acknowledgement is also made to the Haskell Laboratory of Industrial Toxicology for allowing their methoxychlor toxicological data to be incorporated into this manuscript.

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SUPPLIERS BULLETINS

(Continued from Page 89)

325-mesh, to 99.5% or better passing 325-mesh, are available in the single unit, the bulletin states. Changing from one fineness to any other is done by a simple external adjustment while the unit is operating.

Copies of the bulletin are available by writing to the Raymond Pulverizer Division, 1314 North Brusch St., Chicago 22, Ill.

SOR-RIDE, in capital letters with the "S" extending over the top of the entire word and the letter R having its legs extended along the bottom of the word, for insecticides. Filed June 6, 1950 by Paul J. Fleming doing business as Sor-ride Products Company, Portsmouth, Ohio. Claims use since May 24, 1950.

Hexagon in black with Agricultural Chemicals in white capital letters across the center and a circle in white with black silhouette of farmer plowing at the bottom of the hexagon, for herbicides, fungicides and insecticides. Filed October 9, 1947 by United States Rubber Company, New York, N. Y. Claims use since March 30, 1946.

PENCO, in bold capital letters, for herbicides. Filed December 17, 1948 by the Pennsylvania Salt Manufacturing Company, Philadelphia, Pa. Claims use since March 4, 1947.

Fanciful outline of an arrowhead, for agricultural parasiticides. Filed April 13, 1950 by Stauffer Chemical Company, San Francisco, Calif. Claims use since February 24, 1949.

ZOOM, in hand lettered capitals in circular arrangement, for insecticides. Filed June 30, 1950 by Allied Chemical and Dye Corporation, New York, N. Y. Claims use since May 22, 1950.

APHAMITE, in bold face capital letters, for Insecticides. Filed June 30, 1949 by Sherwin-Williams Company, Cleveland, Ohio. Claims use since May 13, 1947.

Bollworm Area Extended

The United States Department of Agriculture announced that cotton ginners and oil mill operators in 12 parishes in Louisiana, one county in New Mexico, 4 in Oklahoma and 44 in Texas will be required to sterilize, fumigate or process their lint, linters and cottonseed against pink bollworm when moving these products interstate from infected areas. The amended quarantine order became effective May 29, 1951 and paralleling intrastate quarantines have already been adopted by the states concerned.

To Expand Chlorine Output

Solvay Process Division of Allied Chemical & Dye Corp., New York, plans to expand its chlorine producing facilities at Hopewell, Va., it has been announced. It is planned to erect an additional unit utilizing a new process not involving production of caustic soda. Cost of build-

ings and facilities for the project will approximate \$2,000,000. The new addition will add 50% to the Hopewell capacity.

APFC MEETING

(Continued from Page 52)

chers' Association.

"Food has won every war and is today our most potent weapon for world peace," the Virginia editor said. "A high standard of living is the arch foe of communism. The strength and security of our nation have been built upon an ever increasing efficiency in agriculture, to which the plant industry has made a major contribution."

Dr. Sanders praised the Virginia grassland farming program "designed to produce more meat and milk for better nutrition at the lowest possible cost," and added that "our entire pasture improvement program is built on the use of lime and the liberal application of commercial fertilizer."

"The fertilizer industry," he said, "just now celebrating 'a century of service to American agriculture,' holds the key that will unlock the door to bigger income, to a higher standard of living, and to better health."

Ferdie J. Deering, Oklahoma City, editor of *The Farmer-Stockman* and president of the American Agricultural Editors' Association, told the convention that farmers of the southwest report "wonderful results with fertilizers" which he termed "an investment in greater profits, not an expense."

"Whether used on row crops, sown crops or on pasture crops, we are finding ways to make more money from fertilizers," Mr. Deering said, emphasizing that "the southwest is going in for fertilizers in a big way." "Another amazing development in the southwest," he said, "is the way in which farmers have taken to laboratory soil analysis as a means of telling them what they need in the way of plant foods."

"Just 10 years ago, we were using only small quantities of fer-

tilizers compared to the older use areas," he added. "We figured our soil was not so old, not so exhausted and we had only limited authentic information on what our soils needed or could use. Some of our data then is now proved wrong, and we now know that our soil fertility problems are more serious than our erosion problems were."

Mr. Deering also cited the importance of visual aids "and similar materials" to help farmers "do a better job of farming and build up their land."

Appearing next on the panel was Dr. R. Frank Poole, president of the Association of Land-Grant Colleges and Universities and also president of Clemson Agricultural College, Clemson, S. C. "The time has not yet come when the consumer public must fear inability of the farmers to produce ample food for the nation and much of the world," he said. "The American farmer of today, fortified with the knowledge of food and fibre production, is our greatest benefactor and his work may well be recorded as an historical achievement of great consequence." He pointed out further that "over-production of foods and fibres is not a calamity but is a worthy and satisfying accomplishment."

Dr. Poole paid tribute to the land-grant colleges and universities in terms of contributions to agricultural education and research. "To understand the complex soil and keep the agricultural lands fertile will require tremendous efforts in scientific research and comprehensive and fundamental educational enlightenment," he said, "it is not enough to know and teach symptoms. To be effective, well planned result demonstrations and knowledge of the specific functions of the element in growing plants must be emphasized. The common technique of testing fertilizers for the most part could be discontinued in favor of fundamental research in consideration of the total needs of the plant."

Edwin Bay, Springfield, Ill., president of the National Association County Agricultural Agents,

told the audience that "it would take an additional 50,000,000 more acres of productive land to maintain present (agricultural) production without the use of fertilizers and we know these acres are not available.

"Fertilizers have made a real contribution to the American economy and to better living," Mr. Bay said. "The rapidly increased use of various types of fertilizers and plant foods has been a major factor in making it possible for American farmers to increase total agricultural production by about 40 percent, as compared to 20 years ago. It has been estimated that as of 1945, the use of fertilizers was directly responsible for at least 20% of our farm production. This is undoubtedly a conservative figure at the present time, since there has been a tremendous increase in the use of all types of fertilizers since 1945." Without the use of fertilizers it would be impossible to produce the amounts of foods and fibres now being consumed and used in the domestic economy and foreign trade.

"The increased production on American farms has served to increase the efficiency of the average farm operation, thus reducing the unit cost of production."

Phil Alainpi, president of the National Association of Radio Farm Directors and Farm Program Director of Station WJZ, New York, declared that "without the use of chemical fertilizers even a rich country like the United States would soon find itself in a position of food shortage, and certainly not conducive to better living."

Mr. Alampi asserted there are "many pamphlets, books and articles on organic gardening" and "within these publications there is a hodgepodge of truths, half-truths, propaganda and to be charitable, complete disregard of known facts."

"We are indebted to the organic gardeners for helping emphasize to the public the importance of organic matter in the soil," he said, but stated "on the other hand, encouraging people to believe that their own diseases can be cured by grow-

ing foods on organically fertilized soils as against using chemical fertilizers or encouraging people to refrain from using a sensible means of insect and disease control, is a distinct disservice."

"Further," he said, "it must be realized that apart from the small garden where refuse can be saved and brought in, the compost pile is wholly inadequate to maintain economically the organic matter in the soil.

"Over the wide area of the earth's surface where food is produced in quantity there is no possibility of accumulating enough plant refuse to compost in piles and thus increase the organic matter in the soil," he said. "In many countries that have been agricultural for many generations, the soil is greatly depleted in organic matter. The most economical and effective way at the present time of immediately increasing crop yields and also increasing organic matter is to use chemical fertilizers which, on these impoverished soils will show immediate results."

Final speaker on the panel was Robert A. Wall, Luray, Va., vice-president of the National Vocational Agricultural Teachers' Association. Mr. Wall pointed out that increases in corn yields can be realized without the preparation of additional acres for the crop. "It can easily be brought about by increasing the amount of fertilizer of the proper analysis", he declared. Mr. Wall recalled that only a few years ago, a yield of 35 to 40 bushels of corn per acre was all that a farmer expected even under ideal growing conditions. "Today, that same farmer or his sons are producing 75 to 80 bushels of corn on the same land and in many cases are exceeding 100 bushels per acre. This change in yield has been brought about mainly by heavier application of fertilizer and use of hybrid seed", he added.

The vo-ag teacher emphasized the importance of fertilizers in grassland farming, pointing out the fact that livestock farmers in the Shen-

andoah Valley are turning to grassland farming. Reasons for this trend, he said, include the high cost and scarcity of farm labor, threat of corn borer, control of soil erosion, and the realization that grasses and legumes represent the cheapest of all feeds.

Emphasizing again the importance of fertilization, he said that "we could not properly teach a job of crop growing to our students today unless we stressed the importance of the proper analysis and amounts of fertilizer to apply."

Mundt at Banquet

SATURDAY evening's program featured the annual Plant Food Council banquet at the Homestead, at which Senator Karl E. Mundt was speaker. The South Dakota Republican called for a bi-partisan "cruising alliance" of all voters in support of the American private enterprise system, and to "write a new Declaration of Independence which will free us forever from the alien creeds of a crumbling world."

Speaking on "Danger Signs in our Domestic Economy", Mr. Mundt declared that "Just as it is essential to fertilize and conserve the soil to promote and preserve the agricultural productivity of America, it is likewise imperative that we perpetuate and promote our free enterprise economic system if the great productive power of this Republic is to withstand the political erosion and the sterilizing seductions of those who would impose political dictation upon the individual initiative of free Americans. Our great challenge in 1951 and 1952 is to find a way in which to give our free way of life a fair opportunity to make America so strong it can retain its freedom."

The Senator asserted that "only in free enterprise America where private initiative and venture capital is still rewarded do we retain the capacity to equip the armies and to finance the exchequers of those who would be free," adding that "in spite of this glorious American record and the sturdy functioning of our American success formula, there

are some in Washington who would have you believe that only the genius of the all-powerful State and the always-ambitious politician can guide us through our present difficulties and provide us with the sinews of war and the strength to compel peace."

"I reject the pleas of these prophets of doom and disciples of disaster who suggest that to defeat political tyranny abroad we must subject ourselves to political dictation at home," he said. "To me, that smacks too much of the suggestion that a man cut off his right arm in order to relieve an aching pain in his left elbow."

"Most of the world's difficulties today stem from the fact that too few men have exercised too much power over too many people for too long a time," he added. "We are beginning to suffer from the ravages of that same malady right here at home. The ceaseless crusade of the professional politician to play the role of Mr. Fixit in the solution of every problem of every country in the world has its volunteers here as it has under every foreign flag. However, history fails to disclose a single political or economic formula ever attempted in any country in any era of history that even *remotely* approximates the dividends flowing from the success formula of our American free way of life.★

FUNGICIDES

(Continued from Page 73)

Downy Mildew of Cucurbits. In the case of downy mildew of cucurbits good control was achieved this year by the use of spray and dust programs employing dithiocarbamates, tribasic copper, and zineb. The efficacy of adequate control was demonstrated when, owing to the low market prices in Immokalee, Sanford, and Winter Garden areas, spray and dust programs were abandoned, and mildew rapidly increased. In one instance in the Sanford Winter Garden area downy mildew was reported as severe in fields which were dusted for control of the disease.

JULY, 1951

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The occurrence of downy mildew on cucurbits so far this year has been limited to Florida. See Fig. 3.

Control of Pecan Scab

R. J. Higdon, of the South Carolina Agricultural Experiment Station, states that the Schley pecan, widely planted in the commercial nut orchards of South Carolina, is one of the varieties most susceptible to pecan scab, caused by the fungus *Cladosporium effusum*. He reports the re-

sults of an experiment in which several fungicides were evaluated for scab control.

Plots of four trees each and replicated four times were set up in an orchard of the Schley variety near Batesburg. This orchard had not produced a crop of pecans in several seasons because of infection by the pecan scab fungus. The sprays were applied with a power sprayer.

The plots were treated as follows: (1) Check (no spray treat-

ment); (2) Bordeaux Mixture applied as 4-1-100 formulation for the first application (pre pollination) and as a 6-2-100 formulation for the later applications; (3) Bordeaux mixtures as in (2) for the first two applications, followed by four later applications of ziram (zinc dimethyl dithiocarbamate) 2-100; (4) ziram, 2-100 for all applications; and (5) Orthocide 406 (N-trichloromethylthioc tetrahydrophthalimide) 4-100 for all applications. Orthocide 406 was not applied at pre-pollination. The fungicides were applied six times (except Orthocide 406 which was applied five times) during the season. The first spray was made April 17 before pollination occurred; while the remaining applications were made at approximately 30-day intervals, with the last application on September 12. DDT was added to the fungicides at the recommended times to control the pecan case bearer and the pecan weevil.

The green shucks of pecans on the trees were examined for scab infection during the third week in September. The results of this examination are presented in Table 1. Shucks of pecans observed on unsprayed trees were 93 percent severely scabbed (Table 1). None of the sprayed trees produced more than 40 percent severely scabbed nuts. The Bordeaux mixture-ziram combination and Orthocide 406 (Orthocide 406 without a pre-pollination spray) produced more nuts in Class 1 and 2 than any other fungicide treatment used.

The effect of each fungicide treatment on the number of nuts per pound was determined from random samples collected from representative trees at harvest time. The differences in unit weight (number per pound) of nuts obtained from the Bordeaux mixture, Bordeaux mixture-ziram, and the Orthocide 406 sprayed trees were not significant (Table 2). The nuts from the ziram-sprayed trees were not significantly less in weight than the nuts from the trees sprayed with Bordeaux mixture, Bordeaux mixture-ziram combination, and Orthocide 406.



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These data indicate that the Bordeaux mixture-ziram combination schedule is superior to ziram for the control of pecan scab. However, Bordeaux mixture alone gave sufficient scab control to permit production of good quality pecans as indicated by the number of nuts per pound (see Table 2). Under the conditions of this experiment, Orthocide 406 appeared very promising, as it was applied only five times in comparison to six spray applications for the other fungicides.

NFA MEETING

(Continued from Page 45)

The present rate of population growth means that every ten years, more than 200 million people are added to the world total . . . more people added each year than are now living in all of North America. "Who will feed

NFA Elections

J. E. Totman, president, Summers Fertilizer Works, Baltimore, Md., was re-elected chairman of the NFA board of directors at the meeting. Vice-chairman is Louis Ware, International Minerals & Chemical Corp., Chicago; and secretary-treasurer of the Association is F. S. Lodge. Dr. Russell Coleman was re-elected president of the NFA.

Following the report of the nominating committee by H. B. Fultz, chairman, the NFA elected the following as directors-at-large for the full 3-year term: L. G. Black, Ark-Mo Plant Food Co., Corning, Ark.; A. D. Kincaid, Southern Cotton Oil Co., Columbia, S. C.; John A. Miller, Price Chemical Co., Louisville, Ky.; and C. T. Prindiville, Swift & Co., Chicago.

These men were reelected directors of the following districts: (1) E. S. Russell, (2) A. A. Schultz, (4) A. W. Weaver, (5) J. H. Epting, (7) Moultrie J. Clement, (8) James W. Dean, (9) M. G. Field, (10) C. R. Martin.

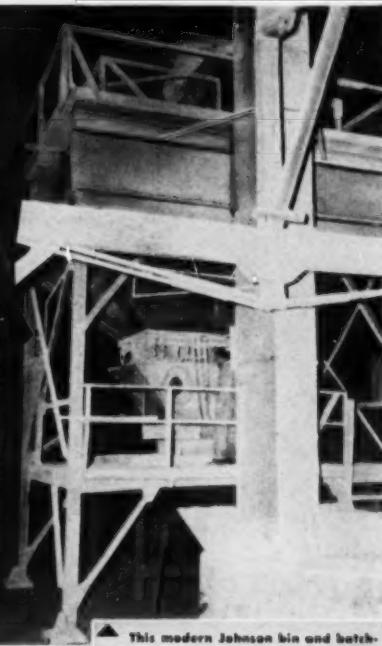
these new mouths? This is the challenge we face on the food supply question."

JULY, 1951

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Whether you are interested in complete plant installations, manual or fully-automatic, or need auxiliary equipment to modernize your present facilities, it will pay you to see your C. S. Johnson Co. distributor . . . or send coupon today for more complete information.

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The Senator suggested two steps to help remedy the situation. "The United States", he said, "Must produce and distribute all the food we can without lowering the capacity of our farm lands to continue such production far into the future. We must get over our fear of surpluses and learn to handle and use any temporary excesses which might be above immediate needs. We must learn to live with abundance."

The second part of the rem-

edy lies in helping people to help themselves. He pointed out that it is impossible to transport adequate quantities of food to needy parts of the world. "It doesn't cure anything to produce surplus foodstuffs where they are not needed if we lack the means of moving them on practical basis to the spot where the need exists", he declared.

The greatest single hope for the needed increase in production of food and fibre, he said, rests with the

fertilizer industry. "The progress that has been made in stepping up farm production through the use of minerals applied to the soil stands out as a beacon light. One has only to see a run-down, worn-out field come green again through the application of nitrogen and phosphate and lime to realize the possibilities. It is clearly an important key in unlocking the door to higher yields."

Facilities of the hotel were taxed to the utmost to accommodate the NFA crowd attending the annual banquet Tuesday night. Mr. Totman presided as master of ceremonies for the program which consisted of the awarding of prizes, introduction of guests and entertainment by the Westinghouse quartet. There were no formal speeches following the dinner.

Fertilizer Essential To Peace

WEDNESDAY morning's session opened with the annual address of Dr. Russell Coleman, NFA president. Dr. Coleman, speaking on the subject "Behind the Iron Curtain", stated that the fertilizer industry has a key position in eventually determining world peace. He pointed out that on the whole, the world outlook for improved food supplies is not good. "Practically all of the world's arable land is in cultivation and is being robbed annually of its ability to produce food", he said. "Despite this fact, the world's population continues to grow, producing more and more hungry people. The only known method of maintaining our soil's productivity is to replace the plant food removed, with commercial fertilizer. The important difference between our situation today as contrasted with the past, is that now we have a means of correcting our inadequate food supply . . . an obstacle to world peace. Not until the scientific discoveries and developments of our present generation has this been possible," he declared.

"The importance of plant food in world peace placed a new light on the fertilizer industry", Dr. Coleman observed. "In the past, its

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importance to our national or international welfare has not been appreciated. Our industry's essentiality for the future must be realized, first by our own leaders, then by agriculture which uses our products directly, and finally by all peoples who benefit from fertilizer usage. It is especially important that those who shape our foreign policy and our economy at home know the significance of food and our industry's importance in the production of it."

Among future problems to be faced by the industry, Dr. Coleman mentioned the sulfur shortage which is bound to affect the production of fertilizers. He also pointed out the long-range effect of the Atomic Energy Commission's interest in extracting uranium from phosphate rock, a process which could furnish increased quantities of liquid phosphoric acid for triple superphosphate or which could be used in the production of present grade of normal superphosphate. This would speed up the present trend toward higher analysis fertilizers, the president said.

He reported also that the NFA has worked out an agreement with the Tennessee Valley Authority to exchange advice and information with respect to fertilizer research, manufacture, distribution and use between TVA and the Association. The objective of this effort, said Dr. Coleman, is to help the two groups to meet their individual responsibilities by providing regular procedures for the periodic exchange of advice and information on problems and findings relating to the fields of fertilizer process, production, distribution and use. The NFA will appoint a committee from its board of directors to consult with a TVA committee on broad policies, he said.

Warns On Inflation

PEAKING on the theme that "Inflation is Fun While it Lasts", Edwin G. Nourse, author and economist stated that although there are some "enjoyable" aspects of an inflationary period such as the one being experienced at present, dire results will accrue if the situation is

allowed to get out of hand. He said that the United States is now living through a crisis testing our "economic sophistication" which will determine whether the people have the character necessary to halt the forces which threaten to destroy democracy. "We are not giving a good account of ourselves", he warned, stating that the American people are too easy on themselves.

"Inflation is like sin", he said in illustration. "Everyone dis-

proves of it in public, but indulges in it privately. Everyone is in favor of letting someone else cure inflation, with each group desiring to be exempt from the rigors necessary to halt the spiral. He used as examples, labor leaders and the building trade, which, he said, demands more and more while insisting that others bring prices down. Such "cute little tricks", he said, add up to acute inflation.

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HLW EMULGATES are the result of a special process by chemist H. L. Woudhuysen, whereby all heavy metals can be formulated as emulsifying concentrates. Any combination of organo-metallic compounds can be tailor-made, if so required.

HLW EMULGATES process these metals attached to an organic radical of a sufficiently high carbon content, so as to make them soluble in oils and organic solvents. Any aromatic or aliphatic acid, when attached to any heavy metal, can be used as a basis for these concentrates and applied in the emulsion form.

HLW EMULGATES are proving their value as agricultural fungicides, seed protectants and deficiency correctors. However, these free-flowing homogeneous concentrates, easily passing into stable emulsions, either single or complex, remain available for many other industrial and technical applications.

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wars in several cities, he said it seems odd for anyone to worry about the abundance of durable goods. Inflation is still with us strongly, and the apparent halt is only temporary, he warned. He pointed out the 20% increase in inflation since January 1, 1950, declaring that the present reduction is but a "sidewise" movement. Even this, he emphasized, is not to be credited to Government efforts, although it will probably claim such credit, he said.

If runaway inflation comes to the U.S., the Russians will have won the "cold war", Mr. Nourse said. The Reds have insisted for years that the democracies are unable to discipline themselves and that their softness and self-indulgence will certainly lead to their eventual downfall. "We have not yet settled down to take the steps necessary to provide a basis for stable, sustained economy on a sound basis", he observed. "The transfusion of paper dollars is no substitute for real nutrition and healthful exercise."

E. J. Condon, assistant to the president of Sears, Roebuck & Co. and president of Friends of the Land, presented the final address of the NFA convention. Speaking on "Farmers on the March", he reviewed the history of farming, pointing out that most of the outstanding advances in technique and "know-how" have come about only of late years. There was but little advancement in agriculture over a period of many centuries, he reminded.

Pointing out that the birth of the fertilizer industry and the beginning of the agricultural revolution came at the same time, Mr. Condon declared that this was more than a coincidence. He said that the fertilizer industry has contributed greatly to the expanded crop yields over the years and emphasized the importance of education for the farmer. More and better crops will result when growers have full information on fertilization and pest control.

On the recreational side, many conventioners, both men and women,

took part in golf, tennis, shuffleboard, putting contests, horse shoe pitching, riding, and card games. Parties were given by American Potash Co.; International Minerals & Chemical Corp. and H. J. Baker & Bro. ★★

SULFUR SHORTAGE

(Continued from Page 63)

long-term solution to the shortage

must be achieved through further expansion of production from higher-cost sources of sulphur. Fortunately, the nation's reserves of such sulphur are vast."

The three new brimstone mines now being developed are Spindletop dome of Texas Gulf Sulphur Company near Beaumont, Texas, and Starks dome of Jefferson Lake Sulphur Company in Louisiana, both



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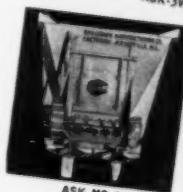
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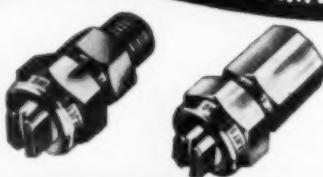
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of which are expected to be in production this year, and the Bay Ste. Elaine dome of Freeport scheduled to begin operation near the end of 1952.

The Bay Ste. Elaine project, lying near the hurricane-swept Louisiana coast, is an amphibious operation. The entire plant, capable of supplying nearly 2,000,000 gallons of superheated water a day to melt the sulphur, will be built on barges at Grande Ecaille, 75 miles distant by water from the dome, floated to the mine site and sunk in place. Because the land over the dome is unstable — two thirds of the area is under water — the molten sulphur will have to be transported in special barges to the company's storage facilities at Port Sulphur.

In addition to the Bay Ste. Elaine project, Freeport is actively pursuing a long-range prospecting program, Mr. Williams said. An exploratory drilling program is now in progress at domes in Louisiana and Texas.

INSECTICIDES

(Continued from Page 48)

where insecticides were not employed, no cotton was harvested. In spite of the general use of modern insecticides, it is anticipated—when the Department of Agriculture's estimate is completed—that the damage from cotton insects in 1950 will be shown to equal—or even surpass—the 1949 record toll of over \$617,874,000.

Forests Saved by DDT

Thousands of acres of valuable forests are saved annually from destruction by insect pests through the aerial application of insecticides. The development of DDT insecticides that are highly effective and reasonable in price offered, for the first time, a tool that may be used to reduce tremendous losses from defoliating forest insects in inaccessible areas. For example, more than 1½ million board feet of lumber was saved through the aerial application of DDT insecticides to control the Douglas-fir tussock moth on 413,000

acres of timber land in the Northwest in 1947. Another noteworthy accomplishment has been the control of an epidemic of the spruce budworm on approximately one million acres of forest in Oregon and Washington by a single aerial application of DDT in 1950. Heretofore, these losses were accepted because no methods were known for combating the pests of forests—a crop with a comparatively low per-acre value.

In addition to saving vital

timber stands, forest insect control is an important factor in the prevention of floods and soil erosion.

The protection of stored pulp wood, green logs, and lumber from wood borers and bark beetles is one of the most serious problems of lumbermen. New insecticides containing benzene hexachloride are now sprayed on the wood soon after cutting and render the wood free of insect attack for almost three months. Huge losses caused by ambrosia bee-

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ties that attack green logs are also prevented if the wood is sprayed.★★

GUEST EDITORIAL

(Continued from Page 34)

ested and very attentive to the carrying-out of safety rules and regulations, then that particular level of employee will be the first to abandon safety practices. Therefore, any successful industrial safety program must have the full and the constant support of the top-level executives. Safety must be viewed by the management as a very definite part of its responsibilities and duties. Such a program should not end before every employee in the industry has been alerted and indoctrinated.

In actual plant operations, on the basis of one very successful approach to the problem, the manager or superintendent has all of his foremen organized into a safety committee which meets regularly. (Usually once a month.) At this meeting, any accidents which have occurred since the previous meeting are analyzed by open discussion, the danger elements which contributed to that accident are spotlighted, in order that the condition responsible may be corrected. The safety committee is composed not only of representatives from management, but also of selected representatives from labor. Both the labor and management representatives are known throughout the organization and constitute the medium through which safety suggestions are brought before the safety meeting. These suggestions are discussed, and means are devised whereby better protection can be given to the men.

Such action, of course, requires follow-up. Hence, a part of the activities at the meeting consists in receiving reports—from whatever supervisory personnel is directly involved — on what progress has been made in carrying out suggestions made at the previous meetings. As a matter of fact, all approved action is listed, and these tabulations provide a constant and visible rec-

ord, both with respect to recommendations made and recommendations carried out.

Thus, it has been demonstrated that the higher brackets of management must be actively interested—and must keep the pressure on the lower brackets—to insure a continuous, live and effective safety organization.

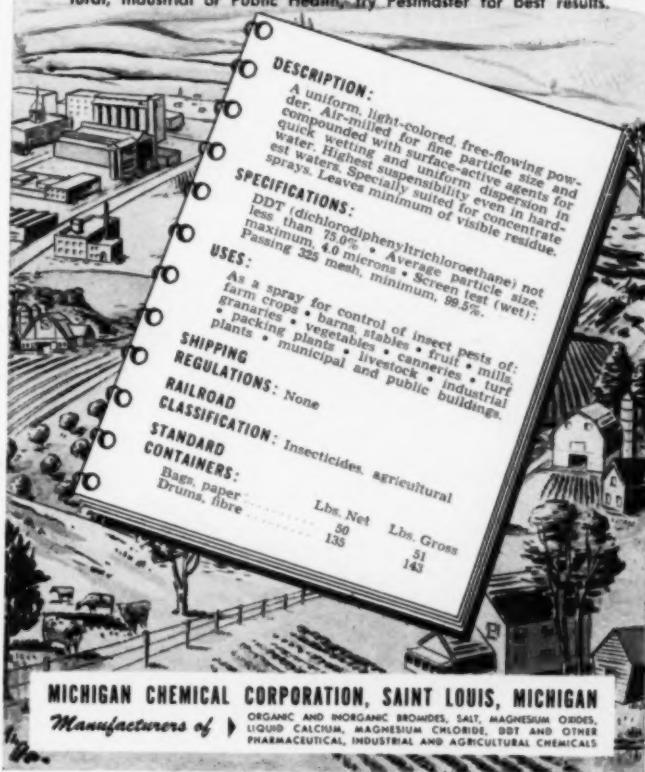
Now, to be a little more specific about how the fertilizer industry can support a well-organized

concentrated effort to improve safety. Such a program will build enthusiasm. The program—carried along by the force expressed in the adage that "Nothing succeeds like success"—will roll faster and faster and good results will appear with surprising speed.

An important step in building this enthusiasm is to publicize progress wherever made. Often, the individual company cannot do this as forcefully nor as fully as may be

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required to cover even a single industry—much less the entire industrial picture. Thus, much force needed to give full impetus to safety is lost. Further, and very important, a unified, organized effort on safety tends to capitalize the fiercely competitive spirit which characterizes American private enterprise, including the fertilizer industry. Individual company management, progressive as it is, is not going to sit back, inactive and asleep at the switch, while rivals make a better showing, produce more goods at lower cost and, at the same time, protect their employees from pain and loss—the inevitable dividends from an accident. I suggest that such a course toward safety is not only wise, but essential. I think all are fully aware of the ever-mounting industrial output and that, in the past decade, fertilizer output was more than doubled in the United States. We also know that fertilizer tonnage is expected to double again in the 1950-60 decade. Should such an increase be required, this industry will meet the need with better methods, better merchandise, expanded capacity and an improved safety record. By cutting losses from accidents, we shall make better use of present resources and will advance our industry towards its ultimate goal.

Recent notable achievement by some individual companies gives indication of the magnitude of total good results which may be accomplished. Such results come in the form of lowered insurance premium costs, less days lost from preventable causes, more output of product, and higher employee morale.

For the industry generally, compensation rates are made on a state-wide basis. In a given state, it is likely that a majority of the plants will be smaller units rather than among the larger in the industry. Currently, it appears that intensive safety programs are not being promoted by the smaller plants, hence the benefits earned by those who do work on safety and who do get good results are somewhat reduced by a high state-wide rate. A bad acci-

dent experience record in one small plant affects the rate structure of all plants in that state. In other words, the highest possible level of safety—state-wide—must be attained if industry is to enjoy the lowest possible rate cost.

Rates for the individual companies having a membership in the National Safety Council—which doubtless is an indication of their interest in promoting safety—are from $\frac{1}{2}$ to $\frac{2}{3}$ of the average for the

industry, as reported by the Bureau of Labor Statistics. Here, then, is a definite yardstick of the dollars-and-cents value of promoting safety: savings in costs from accidents, of from 33- $\frac{1}{3}$ per cent to 50 per cent, by promoting your own safety program. Certainly, through an organized, well administered and effective effort, such savings can be extended to an appreciable degree for the concerns already participating and to a much larger extent for the non-participants.

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There is of course room for improvement.

It is true that the work-injury rate for manufacturing and non-manufacturing declined in 1949 to 15.0, and this is one of the lowest rates recorded in Bureau of Labor Statistics history; however, non-manufacturing industries showed less improvement than manufacturing industries. Of the 76 classifications in this group—a little less than one-half showed improvement; slightly over one-half showed increases or no change. Fertilizers are included in the tabulation of chemical industries which averaged 80 days lost or charged, compared to 114 days for the fertilizer industry only.

I should like to recommend for support, the move recently started in the midwest by a group of fertilizer manufacturers to organize and establish a section on fertilizer plants in the National Safety Council. As has been well said: "In unity, there is strength". The excellent safety records for some companies, which, for the time being, have achieved perfection, shows what can be done, but, I do not believe the industry, as a whole, can attain an enviable safety record by any means short of organized, unified, and concentrated effort.

Following the two organizational meetings in the midwest, just mentioned, and another in Baltimore, more than 50 companies have indicated an interest in forming the proposed section on fertilizer in the National Safety Council. A program on safety for fertilizer companies has been arranged for the next meeting of the National Safety Council in Chicago, Illinois, October 11th. The industry will be encouraged to send representatives to this meeting where ways and means of reducing accidents and industrial illness, such as the exchange of health and accident information, the maintaining of proper records and analysis of accident causes, will be discussed. The aims of the organization basically are as follows:

1. Reduction of industrial injuries and elimination of accident causes by im-

provement in the design of plans and by the development of better work practices in the fertilizer industry.

2. Improvement of working conditions and elimination or control of health hazards.
3. Reduction of accident compensation insurance rates which are currently one of the highest in the country.
4. Practical methods of eliminating or controlling the pollution problems.

I should like to use the strongest possible support for this movement, and also express my personal opinion that the organization I represent will do whatever it can to support the proposed Section on Safety in the National Safety Council. ★★

RADIOISOTOPES

(Continued from page 38)

are excreted from roots is quite unknown at present. As a result we are left with a choice between a very much modified soil solution theory of ion uptake by plants and the contact exchange theory.

Fertilizer Studies

PHOSPHATE relations in soils have been studied intensively. By use of tracers the amount of phosphate bound by a soil has been found to be related to its clay content and to increase as the texture of the soil becomes finer. Because phosphate becomes bound to so great an extent by soils, it is of interest to know how much of the phosphorus absorbed by plants comes from the fertilizer applied in the current year and how much from phosphate bound on soil. Studies on different crops have given varying results which emphasize the differences among plants in their nutrient uptake. Thus Spinks and Barker have reported that in early stages of growth of wheat plants, practically all of the phosphorus comes from the fertilizer. Subsequently, they showed that as the rate of radiophosphorus application is increased, the amount of radiophosphorus in the plant also increases, although the percentage of material taken up by the plant decreases. In contrast, Dean and coworkers reported that less than 2 percent of the phosphorus in potato plants 20

days after their emergence was derived from fertilizer. They noted that contact placement rather than band placement of the fertilizer tended to increase the phosphorus uptake by plants from the fertilizer in greenhouse experiments; the opposite was true in the field. There was a tendency for plants grown on limed soils to have a higher percentage of phosphorus derived from fertilizer than corresponding plants grown on unlimed soils. Potatoes absorb phosphorus from fertilizer through the growing season while corn absorbs phosphorus heavily from fertilizer early in the season and from what is bound in the soil later on.

Radiocalcium has been used in studying similar relations in the soil. In a recent study it was shown that the amount of radiocalcium which leaches through an uncropped soil, as this is related to the rate of its application as a fertilizer, is closely related to the amount of calcium taken up by the plant. Two soil types were contrasted in this study, one having high calcium exchangeability and the other low. On soils unable to exchange much calcium, crops derived more of their supply of this element from fertilizer applied in the current year than on the other soil type. In both soils, the more calcium added as fertilizer, the more of it plants absorbed from fertilizer, but the lower the percentage of the total was absorbed.

The role of organic matter in the fertility of soil is of real interest to the farmer. Surprising results have come from experiments in which a tagged atom was fed a plant and the plant residue was then used as a source of organic matter. Thus green manure was reported by White, Fried and Ohlrogge to be as effective a source of phosphorus for Sudan grass as KH_2PO_4 , a compound considered as a very highly available source of phosphorus. When the stable isotope N^{15} was fed oat plants, and the straw was then used together with untagged calcium nitrate, small amounts of nitrogen were found in plants the succeeding

crop within 2 months by Broadbent and Norman. The tagged nitrogen continued to be found in the second and third crops following.

The rate of decomposition of organic matter can be followed with tracer techniques. When radiocarbon in Sudan grass decomposes, one of the products is carbon dioxide, a gas. The rate of disappearance of radioactivity thus becomes a partial measure of the rate of decomposition of organic matter in the soil.

Tracer techniques are particularly well suited to following the nutrition of plants by those fertilizer elements which a plant requires in very minute amounts — the so-called trace elements. The role which trace elements play in the metabolism of plants has intrigued the plant physiologist for many years. Recently it has become fashionable to say that these elements are active in enzyme systems of plants, but it is difficult to determine their distribution in plants and to know that this is the only role they play. The work of Stout and Merger has shown how the pattern of distribution of a trace element can be measured with radioisotopes. By supplying radioactive molybdenum as a nutrient to tomatoes they found that this element was rapidly accumulated by roots in concentrations greater than it was supplied. Radioautographs (pictures made by the radioactivity itself) showed that molybdenum accumulated where there was the greatest number of stomatal openings, a distribution found for no other element as yet. In the absence of molybdenum, chlorophyll disappeared in the same interveinal areas where molybdenum accumulates. This work suggests strongly a role as a functional group in an enzyme system.

Ammonium sulfate containing heavy nitrogen, N^{15} , has been traced in plants. Although experts on soils frequently consider that ammonium compounds are first oxidized by soil bacteria to nitrate ion, it has been known for many years that ammonium ions are absorbed by plants as such. When followed with a mass spectograph, the heavy nitrogen in

ammonium sulfate was found to be absorbed rapidly and to be moved to aerial portions of the plant without change. There it tended to accumulate in more mature tissues, which suggests that it is here that the conversion from inorganic to organic compounds occurs.

Helpful to Pesticides

STUDIES in pest control are being aided by tracers. Although they have been used far less in research in weed control, and in plant disease and insect control than they have in studies of fertilizers and soils, this is because the techniques have involved synthesizing "hot" or radioactive molecules of organic compounds to use them in these fields. For example, to apply tracing techniques to studies of weed killing compounds it is necessary to synthesize them from very simple organic compounds, one of which is tagged. This procedure is far more difficult than synthesis of a weed killer which is not tagged because one must generally start with a radioactive element and build it, step by step, into the compound desired. Nonetheless 2,4-D molecules have been made in two different ways: by making 2,4-dichlorophenoxyacetic acid in which the carbon of the carboxyl group is tagged with carbon 14, and by making 2,4-dichloro-5-iodo-phenoxyacetic acid in which iodine-131 is the tracer. Such studies are further complicated by the possibility that a radioactive carboxyl group may be split off the tagged molecule immediately, either by exchange or by decarboxylation so that the tagging is lost. In this case results lead to a false conclusion, and the investigator must be very certain that such an event has not happened before he reports.

Tagged molecules can be used as productively for following what happens to fungicides and weed killers as in the kinds of study already noted. An example in the field of weed killers is the work of Mitchell and Linder who used I^{131} in 2,4-dichloro-5-iodo phenoxy acetic acid and its morpholine salt. They showed that in absolute amounts more of

the salt is absorbed by plants, but that the salt accumulated in the growing point to a greater extent than the acid did.

How much does the formation of a weed killer affect the amount that enters a plant through the leaf? Because weed killers are active at exceedingly low concentration, the research worker using ordinary methods would have to rely upon biological effectiveness rather than upon chemical analysis to answer this question. Tagged molecules make direct measurement possible. When cosolvents and surface agents are combined with 2,4-D as formulating agents, absorption and translocation in the plant was increased by as much as 350 per cent.

In plant pathology isotopes are also proving their worth. Work at the Battelle Memorial Institute under Dr. K. Starr Chester is under way in which the mode of action of fungicides is the subject of study, and at the Boyce Thompson Institute, Drs. S. E. A. McCallan and Lawrence Miller are investigating how sulfur kills fungi as well as what becomes of fungicidal sprays after they are applied to leaf surfaces. At the Connecticut Agricultural Experiment Station work is in progress on the possibility of therapy of plant diseases using ionizing radiation and on tracing chemotherapeuticants in the plant to determine where they go and how they act.

Already, two papers have appeared which describe how isotopes have been used in solving problems of plant pathology. Yarwood (1950) has exposed bean leaves infected with rust to vapors of H_2S arising from sodium sulfide in which the sulfur was tagged. The rust pustules were found to accumulate the radiosulfur more than normal leaf tissue did, the accumulation being sufficient that a radioautograph could be made of the pustules. Geiger counts up to five times that in normal tissues were obtained in infected areas.

In another study the metabolism of elemental sulfur, which was applied to lemons as an insecticide was studied, using radiosulfur. What

happens to elemental sulfur on application to lemons was found by analyzing for the specific activity of sulfur as H_2S , SO_2 , and SO_4 . The bulk of the sulfur appeared as H_2S , some appeared as SO_2 , and surprisingly large amounts appeared as SO_4 , although this was less than appeared as H_2S . As a result of this study it is suggested that the sulfur burn on plants which is associated with hot weather, is the result of formation of H_2SO_4 and similar products.

Entomology, too, has found that radioisotopes can provide the answers. Radioactive mosquitoes were produced by raising larvae in water containing radiophosphorus and strontium. With tagged insects, it was possible to study the migration of insects and their density as a function of distance from point of liberation. They were found to become dispersed more through air currents than through their own flight.

In another study, wireworms had small needles containing radio-cobalt stuck into them and were liberated into the soil. Their migration in the soil could be followed with a Geiger counter. One could move the counter over the area where they were and at point of greatest counting rate, locate their position. By adjusting the counting rate per needle in each insect, one could determine how deep they are in the soil by the counting rate.

Still another study has made use of phosphorus-tagged bis-(bis-dimethyl amino phosphorus) anhydride. This compound ("Pestox III") is a systemic insecticide and is absorbed by roots of plants. The tagged molecule was applied to plants and counts showed its absorption and systemic distribution in the plant in a fairly short time. Most startling was the fact that the honeydew produced by aphids feeding upon plants which were watered with the systemic insecticide was found radioactive. Apart from its mere startling character, this study indicates that the organically combined phosphorus becomes involved in the sugar metabolism of organisms, a factor which

needs more study before the wide adoption of organic phosphorus poisons to food crops.

We have discussed some of the principles underlying studies with radioisotopes in agriculture and have noted only a very few of the many significant and important studies which are being carried out with this technique today. There are many pitfalls in unwise use of the technique, as with any other method, but the properly informed experimenter may find that many of his difficult problems can be solved more simply with their use.★★

PROGRESS IN '52

(Continued from page 59)

Fertilizer Safety Program

THE problem of safety in the operation of plants is of prime importance to the industry. Even beyond the considerations of ordinary humanity and the obligation to make working and living conditions the best possible for employees, there lies an economic factor which demands safe working conditions.

This question of safety is an individual one in each plant. No two are alike and each has its own hazards that should be eliminated or so reduced as to make operations as safe and foolproof as possible. Each plant too has its own State Workmen's Compensation Laws to observe, generally with State factory safety regulations, building codes and inspections.

Present-day mechanization has done away with many former serious hazards. The undermining of storage piles with subsequent cavings catching workmen is a thing of the past in most plants.

Coming Year's Outlook

THE outlook for the coming fiscal year is somewhat confused by the prospects of rapidly changing conditions and increasing government controls. It now seems apparent that there will be available some 15% more nitrogen and 15% more potash than were used during the year just closing. These estimates do

not include potential increases in imports nor do they contemplate any effects of allocations or controls, or any labor or transportation difficulties. Superphosphate is our serious concern, and its supply depends entirely on sulfuric acid which, in the main, depends on sulfur. The fertilizer industry, under the present allocation order cannot expect to receive more sulfur than during 1950, with prospects for somewhat less. With inventories and stocks of both sulfur and superphosphate reduced to the minimum, there is little prospect for next year's superphosphate supply to be more than 90% of last year's. Every effort is being made to recover spent acid and hitherto waste acid and to reclaim sulfur from natural gas and smelter fumes to help out the shortage. New processes for the production of available phosphoric acid are under study but it is doubtful whether they can be developed in time to be of help the coming year.

Even with this handicap the fertilizer industry will be able to supply most of the farmers with fertilizer, perhaps not always the exact grade and type wanted, but some substitute that will be suitable for his crop. There will be available more than 2½ times the amount of plant food consumed in the average of the pre-war years 1935-39. Now plants are being built in the newer consuming areas and there is considerable expansion under way for the production of concentrated superphosphate.

As an industry we pledge that every effort will be made to the end that we shall continue to serve agriculture with its fertilizer needs so as to insure maximum production of the food, feed and fibre crops necessary to fulfill our national and international obligations.★★

Walter W. Knight Dies

Walter W. Knight, 61, sales manager of Mathieson Chemical Co., Baltimore, died in Durham, N. C. recently. He was sales manager for Temple Cotton Oil Co., North Little Creek before joining Mathieson.

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Rates for classified advertisements are ten cents per word, \$2.00 minimum, except those of individuals seeking employment, where the rate is five cents per word, \$1.00 minimum. Address all replies to Classified Advertisements with Box Number, care of AGRICULTURAL CHEMICALS, 254 W. 31st St., New York 1. Closing date 23rd of preceding month.

Positions Open:

Entomologist to take charge of investigations in the control of cotton bollworms in Africa required. Excellent opportunity for entomologist with experience of cotton pests. Salary \$4,500 to \$5,500 free of tax. Free housing and passages for entomologist and wife. Three months' leave per annum in Europe or South Africa. Two years' contract in the first place. Write stating age and full particulars of qualifications and experience to Personnel Manager, Pest Control Ltd., Bourn, Cambridge, England.

"Self-starting" Entomologist for growing subsidiary of reputable national manufacturer. Experienced, well-rounded, individual who can advise management, assist salesmen through field-trip work, conduct technical development on new—old products. Unique position in that no other personnel is now so employed. Position has challenge and independence of small business with big-business security. Location in the East. All replies confidential. Address Box No. 547, % Agricultural Chemicals.

Agricultural Chemical Salesman required by major manufacturer. Location—Midwest. Please state technical background and experience. Excellent future for right man. Address Box No. 550, % Agricultural Chemicals.

Positions Wanted:

Branch Manager: responsible, young Ohio man, with successful sales record in garden and insecticide industry desires connection in sales or management. Formerly, associated with Standard Oil subsidiary marketing small-package chemicals to hardware, nursery, & department stores. Experience in assisting jobber salesmen with merchandising suggestions; training new personnel; addressing dealer groups; and selling both newspaper ads and radio time to retailers. Clean record; eligible for immediate rehire. Address Box No. 548, % Agricultural Chemicals.

Sales Representative: Man age 36 married, no children, wants sales staff

job with agricultural chemicals company. 5½ years with last employer. Past experience includes two years as administrative assistant to General Manager handling public and industrial relations and 3 years as chemical sales representative. Selling emphasis placed on herbicides (plant hormones and oxidizing) for pre-emergence and contact control, but also sold organic and inorganic insecticides and fungicides and fertilizers. Will travel and will accept either foreign or domestic location. Address Box No. 549, % Agricultural Chemicals.

Miscellaneous:

Available: 45,000 sq. ft., 250 lbs. per sq. foot weight load—Steel racks, modern fireproof building, R. R. Siding. Available December through June each year for storage and packaging of insecticides or fertilizers. Prospectus on request. E. P. Hinkel & Co., Inc., 600 Rhode Island Avenue, NE, Washington, D. C.

"If you are planning on expanding, or increasing your production in other areas because of the crisis, write or call Mayor G. A. Gilbert or J. G. Ihnet, City Promotional Manager, for a copy of "A Preliminary Industrial Survey of Watertown, South Dakota."

Will Buy: Copper sulfate, DDT 100% or other, benzene hexachloride, small or large quantities. Also invite offers, inquiries alkalies, solvents, industrial chemicals. Tobey Chemical Company, 1480 Broadway, New York 18, N. Y. Tel. Long Acre 4-2520.

Helps India Fight Locusts

Aldrin, which was recently used in Iran to fight locusts, will now be sent to Rajputana province and neighboring states in northwest India for the same purpose. Two tons of the insecticide, which is produced by Julius Hyman & Co., Denver and distributed by Shell Chem. Corp., New York, is now being shipped to India for use against locusts threatening two major crops, jowar and bajra. These are types of millet, the staple food for the dry areas of northern India.

CONSULTING ENTOMOLOGIST

Insecticides—Formulation
Plant Pathology—Research
Entomology—Legal Service

Author of
"Chemistry & Uses of Insecticides"

DR. E. R. de ONG

926 Stannage Ave., Albany 6, Calif.

ALVIN J. COX, Ph.D.

Chemical Engineer and Chemist

(Formerly Director of Science, Government of the Philippine Islands. Retired Chief, Bureau of Chemistry, State of California, Department of Agriculture.)

ADVISER ON AGRICULTURAL CHEMICAL PROBLEMS AND INVESTIGATIONS

Consultant in reference to spray injury and damage, claims, including imports of fruits and nuts, formulas, labeling, advertising and compliance with law.

1118 Emerson Street
Palo Alto, California

Theodore Riedeburg Associates

Sales Consultants
and
Manufacturers' Representatives
on
Agricultural Chemicals

Sixty-third Floor, Chrysler Building
New York 17, New York
MUrray Hill 4-1677

FLORIDA FIELD TRIALS

Testing agricultural chemicals in the field during the winter months.

DR. G. R. TOWNSEND

P. O. Box 356
Belle Glade, Florida

Baker Leases NY Facilities

H. J. Baker & Bro. has leased the 19th floor of the Sinclair Oil Building, 600 Fifth Ave., New York, it has been announced. The company formerly had offices in Madison Ave., New York.

AGRICULTURAL CHEMICALS

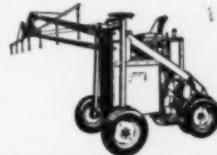
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FARMERS GROW BETTER CROPS AT LESS COST with

John BEAN
SPRAYERS



ROUTING CORN BORER is a job for the John Bean self-propelled Hi-Lo sprayer. Clearances up to 6 feet permit use in tall corn to get after second year borer damage that can't be hit by driver while spraying. When you sell the Hi-Lo you offer the most efficient corn sprayer there is.



LIVESTOCK PARASITES are quickly controlled with a John Bean high pressure sprayer. The spray gets down through matted hair to the hide where it gives better, longer-lasting protection. Increased meat and milk production make ownership of a John Bean sprayer a "must".



AUTOMATIC ORCHARD SPRAYING with one of the three types of John Bean sprayers saves labor, saves time, and permits one man to thoroughly cover up to 75 acres a day. Fruit growers in your area want John Bean equipment to get better fruit at less cost.



WEED CONTROL is fast and effective with a low-cost John Bean tractor-mounted sprayer and boom. Pump mounts quickly on tractor power-take-off so there is no interference with other farm operations. The Bean tractor mounted sprayer presents a real sales opportunity for you.

John Bean dealers have many other sprayers and farm equipment to help them build sales and profit . . .

Spartan portable sprayer: The Ranger for brush and weed control; All Purpose farm sprayer; Speedsprayer: Automatic; Rotomist and more. Write for complete information on the John Bean line.



John BEAN
Lansing 4, Michigan

Dept. AC-7

Division of Feed Machinery & Chemical Corp.

Tale Ends...

LONG with the stories, good-natured ribbing, etc. at the recent meetings of the NFA and APFC, was heard a little ditty, obviously a take-off on a popular ballad. It was "Old fertilizer men never die; they just smell that way." Proof that it was uttered in the right spirit is seen by the fact that it was fertilizer men themselves who were singing the tune and laughing about it.

Members of the Westinghouse quartet were giving out with an informal "Sweet Adeline" variety of

harmonizing during the social hour preceding the banquet at the Greenbrier. Hearing the music, a number of conventioners joined in and found themselves rendering some real harmony with the help of experts. The Quartet, incidentally, did a fine job of entertaining following the dinner. (This was without the accompaniment of the before-mentioned conventioners.)

Bemis Bro. Bag Co. uses its advertising space this month (on op-

"Wonder how Cuthbert's coming with that new ether base insecticide."

WHEN a business man reads his industry magazine he is not usually in quest of entertainment or light reading. He is after facts,—facts of aid and interest to his business. He is very definitely "business minded" as it were. And that is why advertising in industry magazines,—or business papers, if you prefer the term,—gets to him when he is in the correct frame of mind, and why it can be and is more effective for advertising industrial products. If you would catch the key men in the field of chemicals for agriculture when they are "business minded," try advertising in

AGRICULTURAL CHEMICALS
254 WEST 31st STREET
NEW YORK 1, N. Y.

posite page) to talk about danger from inflation. This advertisement is being brought before a wide audience by Bemis, appearing in *Time* and 35 trade publications.

The way in which Republican Senator Karl E. Mundt handled himself at the recent meeting of the American Plant Food Council at Hot Springs, was the subject of considerable comment following his speech. On the platform with a number of distinguished Democratic leaders including Secretary of Agriculture Charles F. Brannan and Congressmen Abernathy, Poage and Cooley of the House Agriculture Committee. Sen. Mundt ribbed the group good-naturedly and got through his talk without bloodshed.

Marijuana plants growing in scores of vacant lots in Queens, New York City, are being squelched by applications of 2,4-D put on by the Department of Sanitation. It is reported that the chemical will practically eradicate the illegal plants within a short time. The City is also launching a 2,4-D war on ragweed in all boroughs in an attempt to relieve hay fever sufferers.

Recent bulletins from Washington comparing price increases in the chemical industry show that agricultural chemicals have not risen as much as have some of the others. Whereas agricultural chemicals have gone up from a level of 99.3 (April 7, 1950) to 106.0 a year later, other items such as essential oils and other aromatics jumped from 96.2 to 171.7. Oils, fats and waxes went from 103.1 to 189.2 in that period, according to the report. Coal-tar chemicals were 98.1 in 1950, and 125.5 in 1951.

The fertilizer industry, particularly, terms its product as the "farmers' best buy," and certainly from the standpoint of increases of just about all the commodities growers must have to continue in business the price of fertilizer is really low.

AGRICULTURAL CHEMICALS

There IS something YOU can do ABOUT INFLATION!

**Your future...
the future of
your business,
large or small,
depends on how
many people
understand
the story in
this booklet!**



Businessmen recognize inflation as the nation's greatest single threat. But most of us have felt "What can one man—even one business—do to stop it?" But there is a way—if enough of us work at it. We can

help more people...the men and women who work and vote and pay taxes...to understand the nature of inflation, its causes and cures. Then we will have gone a long way toward eliminating this pending catastrophe.

ONE TOOL YOU CAN USE: To help us give our own Bemis workers the inflation picture, we used the colorful, new 16-page booklet "How Stalin Hopes We Will Destroy America" produced by Pictorial Media, Inc. The more widely the booklet is used, the more good it will do...and it is available for distribution to your workers, too. It follows the time-proven "comic book" technique...dramatizes the dangers...and shows how all our citizens can help halt inflation before it's too late.

TESTS SHOW IT HELPS WORKERS: To get an impartial judgment of the value of "How Stalin Hopes We Will Destroy America," it was tested in Bemis plants by the Psychological Corporation under the direction of Dr. Henry C. Link, a foremost research authority.

Dr. Link says "Those workers exposed to the booklet were found to have a significantly higher appreciation of the recommended ways to stop inflation than did the workers who did not see the booklet. Details of this test are available upon request." And Bemis factory workers make such statements as "Everything it says hit home, but you'd never figure it out for yourself

until you read it"...."It's told in an interesting way so anyone can understand. My daughter, age ten, understood all of it"...."In picture form it impresses you more. Most people don't read about it"...."Had ideas that we wouldn't think about otherwise while we are working away—good book, agree with it—I guess I won't be the only one."

Because we believe this message is growing more urgent every day, Bemis is taking this means to commend to other businesses this weapon against inflation. It is the first of a series of such material that we expect to use.

BEMIS BRO. BAG CO.
St. Louis 2, Missouri

FOR EVERY BUSINESS, LARGE OR SMALL: In quantities, it costs only a few cents a copy—\$10.00 for 100 copies, down to 3 cents per copy in larger quantities. Single copy free. For full information, write PICTORIAL MEDIA, INC., Attention: Paul Wheeler, 205 E. 42nd ST., NEW YORK 17, N.Y.

TOXAPHENE

HERCULES POWDER COMPANY
INCORPORATED
970 Market Street, Wilmington, Delaware
MAKERS OF TECHNICAL TOXAPHENE FOR AGRICULTURAL INSECTICIDES